RETROSPECTIVE ANALYSIS OF THE ALASKA HALIBUT AND SABLEFISH INDIVIDUAL FISHING QUOTA FISHERIES COMPARING THE PROGRAM WITH THE ANTICIPATED OUTCOMES AND OTHER LIMITED ENTRY FISHERIES

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A Dissertation Submitted in Partial Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy

in

Natural Resources and Sustainability

University of Alaska Fairbanks

May 2020

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Abstract

The Alaska Halibut and Sablefish Individual Fishing Quota (IFQ) program is one of the largest and most successful catch share programs of the United States and the world. It has been successful in maintaining the economic value and owner-operated characteristics of these fisheries for the past 25 years. While most of the federal fisheries off Alaska have already transitioned to catch-share management systems, the development of new catch share programs for other regions could benefit from lessons learned in the development and evolution of the Alaska halibut and sablefish IFQ program.

One of the main concerns of the policymakers with implementing an IFQ program was the potential loss of halibut and sablefish QS held by residents of remote communities in the Central Gulf of Alaska and the Southeast Alaska regions and the resultant long-term social changes. That concern remains, along with a related concern about perceived financial barriers to entry the Alaska Halibut and Sablefish IFQ program. The resilience of fishery-dependent communities depends on the state of the available fish resources as well as the extent to which community residents are vested in the fishery through ownership of limited license permits and quota share.

This thesis consists of five chapters. The first is an overall introduction, which summarizes the entire thesis, and the final chapter is an overview conclusion of the research that was conducted. The three central chapters review the history of the fishery, gauge stakeholder attitudes about aspects of the program, and explore limitations to the successful adoption of measures intended to empower community engagement in these fisheries.

Chapter 2 describes the evolution of the Alaska region Pacific halibut and sablefish fisheries over the past 139 years. This history can be divided into seven eras, each characterized by unique opportunities, challenges, and management innovations. The chapter shows that fluctuations in fish populations have been influenced by the interplay of management actions and environmental variation.

The third chapter is a survey of Pacific Halibut and Sablefish Quota Share (QS) holders. This survey gathered information on crewmembers and operating costs in the Alaska halibut and sablefish fisheries. The results indicate that, on smaller vessels in certain areas, crewmembers tend to be drawn from the local region. In comparison, the crewmembers on larger vessels that fish in more remote areas tend to be drawn from outside those fishing areas. Results also indicate that residents of small fishing communities in remote areas had difficulty in obtaining financing to purchase QS for halibut and sablefish. In contrast, residents of larger communities expressed less concern about access to financing for QS purchases.

The fourth chapter focuses on the evolution of the Alaska halibut and sablefish IFQ program. The impacts on the small communities following the transitions from open- to limited-access or share-based

management were negative for some communities and positive for other communities. Over the past 16 years, several programs have been established to benefit fishery-dependent communities. Chapter 4 provides an overview of community-support measures developed for these fisheries and describes similar programs created for other Alaska region fisheries. These programs are not being fully utilized. In order to build their local fleets, communities need to increase cooperation and coordination to establish quota. Chapter 4 establishes a "roadmap" for sustaining and rebuilding community-based fisheries in Alaska. It requires the community to focus on its cooperative goals to enable them to take advantage of the community support measures included in fisheries regulation.

There seems to be more interest in the younger generation in Alaska wanting to get involved in commercial fisheries. Evidence includes the popularity of the apprenticeship program developed by the Alaska Longline Association in Sitka and the keen interest in the annual Alaskan Young Fishermen Summit hosted by the Alaska Sea Grant. Rural communities could encourage the development of the next generation of fishermen by nurturing their youth's interest in fisheries and reestablishing their cultural heritage. This could be done by using the Federal halibut special permits for Ceremonial, Celebration, and Education fisheries. These permits are free and require a minimal amount of paperwork through the NOAA Fisheries Restricted Access Management program. The State of Alaska also has an educational permit program that is currently underutilized but has been successfully used in the past. Reestablished of these programs in local schools could foster youth's interest in their cultural heritage in fisheries.

The positive outcome of this research is the information provided for rural communities to engage in more opportunities to generate fishing income for their community. Communities could have a real opportunity to bring commercial fisheries back into their rural areas. If the communities can navigate through all the regulations, it could provide a positive economic stimulus for the next generation of youth in their communities.

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List of Abbreviations and Acronyms

ABC	Acceptable Biological Catch
AFA	American Fisheries Act
OLE	NMFS Office of Law Enforcement; Also NMFS Alaska Enforcement Division;
BSAI	Bering Sea and Aleutian Islands
BOF	Alaska Board of Fisheries
CDQ	Community Development Quota
CHP	Charter halibut permits
CQE	Community Quota Entities
CV	Catcher Vessel
CP	Catcher Processors
EBS	Eastern Bering Sea
EEZ	Exclusive Economic Zone
FCMA	Fisheries Conservation and Management Act
FMP	Fishery Management Plan
FSD	NMFS Financial Services Division
GAF	Guided Angler Fish
GOA	Gulf of Alaska
IERS	Interagency Electronic Reporting System
IFQ	Individual Fishing Quota
IPQ	Individual Processor Quotas
IPHC	International Pacific Halibut Commission
IPQs	Individual Processor Quotas
IVQ	Individual vessel quota
LEP	Limited entry programs
LOA	Vessel Length Overall
MSA	Magnuson-Stevens Act
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fisheries Management Council
NOAA	National Oceanic and Atmospheric Administration
OFL	Overfishing limit
TAC	Total allowable catch
WPUE	Weight per unit of effort

Acknowledgments

Many people were very generous in offering their time, their comments and in a number of cases providing me information on various aspects of the Alaska fishery. I would like to express my thank to Dr. Keith Criddle of the College of Fisheries and Ocean Science, and my committee chair for the generously taking time to discuss the initial comments and encouragement over the years as well as the input on the organization of the dissertation. I would also like to thank my other committee members Dr. Joshua Greenberg, Dr. Ronald Felthoven and Dr. Brian Vander Naald for their comments and their encouragement to expand academically.

I would also like to thank Glenn Haight, provided many suggestions in the design of the survey; and to Sea Grant and the University of Alaska Fairbanks for their support for the survey. Linda Behnken Alaska longlines Associations for all of her comments and suggestions on the final chapter. Also, I'm grateful to NOAA fisheries to allow me to enter into the Advance degree program.

Many thanks go to my family and friends for their support and inspiration. My parents, Mimi and Al Kotlarov, who always encourage me to study and learn and to help others. My wonderful children, Zander and Nakenna who had a level of encouragement that was helpful over the years. And last but most definitely not least, I am forever grateful to my wife, Kym for the patience and encouragement over the many hours this research took.

Chapter 1. Overall Introduction

This dissertation develops insights and lessons from the Individual Fishing Quota programs for the commercial Pacific halibut and sablefish fisheries. The dissertation consists of five chapters. This chapter provides an introduction to the dissertation organization and content.

Chapter 2, "Development and Evolution of the Alaska Halibut and Sablefish Fishery," describes the evolution of the Alaska region's Pacific halibut and sablefish fisheries over the past 139 years. This history can be decomposed into seven eras, each characterized by unique opportunities, challenges, and management innovations. The halibut and sablefish fisheries have been affected by fluctuations in fish populations influenced by the interplay of management actions and environmental variation. Under the oversight of the International Pacific Halibut Commission (IPHC), the halibut fishery has been managed under science-based catch limits since the early 20th century (IPHC 1987). Under the IPHC, halibut stocks were rebuilt in the mid-20th century but plummeted in the 1960s and early 1970s as foreign fishing fleets exploited those portions of the halibut stock available outside of national 12-mile territorial seas. The stock and harvests of halibut and sablefish recovered quickly following the 1976 closure of the United States Exclusive Economic Zone (EEZ) to foreign fishing. The Fisheries Conservation and Management Act of 1976 (FCMA, MSFCMA, or MSA) extended the U.S. fishing boundaries from 12 miles to 200 miles from its coast.

During this time, ex-vessel prices were strong, but the season length was repeatedly shortened to prevent overharvests. In 1975, the halibut season was open for about 125 days; by 1980, the number and fishing power of active fishing vessels had greatly increased, and the season had been reduced to about 25 days, yet harvests remained high at nearly 80 million pounds. By the late 1980s, thousands of halibut vessels raced to catch fish in a 2-3 day derby. Similarly, the sablefish season off West Yakutat declined from 200 days in 1984 to 50 days in 1985 and continued to decline to as few as 10 days in 1994. This temporal contraction in these fisheries decreased vessel safety, resulted in excess harvests, and reduced product quality, particularly in the halibut fishery.

There was a broad consensus among managers and fishermen that change was needed, but there was little consensus about how to best change the regulation and management of the fishery. Top concerns of fishermen and managers included the necessity of fishing in hazardous seas when fishery openers are short, low ex-vessel prices, escalating operating costs, too many vessels in the fishing fleet, and the lack of precision of in-season management measures. When individual fishing quota (IFQ)-based management was first proposed for the halibut and sablefish fisheries in the late 1980s, there was considerable opposition from some fishermen, but other fishermen acknowledged that a change in management was needed for the fisheries

to remain sustainable. As the race-for-fish continued to intensify in both fisheries, and after numerous public meetings and extensive analysis of alternatives, the North Pacific Fishery Management Council (NPFMC) approved the Alaska halibut and sablefish IFQ program in late 1991. Following review by the Department of Commerce and after overcoming legal challenges, the program was implemented at the start of 1995. The Alaska Halibut and Sablefish IFQ program was intended to increase manageability of these fisheries and reduce the likelihood of overharvests while minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, maintaining a broad and heterogeneous distribution of quota share ownership, and preserving the owner-operator character of the fishery.

Designing, adapting, and implementing a catch share program, such as the Alaska Halibut and Sablefish IFQ program, is challenging and frequently controversial even though catch share programs are widely recognized as an effective approach to end the race-for-fish, reduce overfishing, and increasing economic value to fishermen (Costello et al. 2008; Grimm et al. 2012; Melnychuk et al. 2016). Program outcomes depend on the interplay between program design features and factors outside of management control. Factors such as external market forces, exogenous variations in stock abundance and distribution, unexpected interpretations of the regulations, and unintended consequences—spillovers—affect program success and broader impacts.

The Alaska Halibut and Sablefish IFQ program has been in operation for 25 years. In its design, policymakers took into consideration the elements and outcomes of other IFQ programs from around the world. This foresight and planning have made the Alaska halibut and sablefish IFQ program more successful than some other catch share programs (Brinson 2013). Nevertheless, while the program led to increased ex-vessel prices for halibut and sablefish, it redistributed value from processors to harvesters (Matulich and Clark 2003, Herrmann and Criddle 2006), gave a valuable windfall of assets to initial recipients, (principally comprised of vessel owners based on catch history) and may have contributed to the decline of remote fishery-dependent communities (Carothers 2008). The Alaska halibut and sablefish IFQ program has been repeatedly amended to remedy unanticipated and unintended outcomes and to address evolving social concerns. The outcomes of this program and its evolution provide lessons for the development and design of new IFQ programs for fisheries off Alaska, elsewhere in the United States and beyond.

The third chapter, "Characterizing Crew and Fuel Prices Impacts: A survey of Pacific Halibut and Sablefish Quota Share Holders," presents the results of a survey that gathered information on crewmembers and operating costs in the Alaska halibut and sablefish fisheries. The survey was designed to explore trends in the number of full- and part-time crew positions, the extent to which quota share (QS) holders fish from their homeport, and the locations where gear and supplies are purchased. The survey also collected QS-holder perceptions about the impacts of recent variations in fuel prices and operating costs, and their prospects for purchasing additional halibut or sablefish QS.

The survey results indicate that, on smaller vessels in certain areas, crewmembers tend to be drawn from the local region, while the crewmembers on larger vessels that fish in more remote areas tend to be drawn from outside those fishing areas. Results also show that vessels operating in more remote areas tend to have higher operating costs and greater difficulty finding crew compared to areas of Alaska that have larger populations. Survey results also indicate that residents of small fishing communities in remote areas had difficulty in obtaining financing to purchase QS for halibut and sablefish; residents of larger communities expressed less concern about access to financing for QS purchases.

The fourth chapter, "A Review of Community Support Measures Included in Alaska Fisheries and a Roadmap for their Use in Sustaining and Rebuilding Small Fishing Communities," focuses on the transformation of Alaska commercial fisheries and how it has affected small coastal communities. Alaska's fisheries policies and regulations are credited with maintaining the biological integrity of fish stocks, but some perceive those same policies and regulations as reshaping the economies of fishery-dependent communities (Himes-Cornell and Hoelting 2015; Carothers et al. 2010; Carothers 2008). When the MSA expanded the U.S. fishing boundaries from 12 miles to 200 miles offshore, the act also encouraged the expansion of U.S. fishing fleets to Americanize the fisheries in the U.S. EEZ. This expansion of the U.S. fleet was particularly dramatic in the U.S. EEZ off Alaska, where groundfish stocks had been exploited almost exclusively by foreign-flagged fishing fleets. Between 1976 and 1990, the groundfish fisheries off Alaska went from largely foreign catching and processing to joint ventures between U.S.-flagged catcher boats and foreign-owned processors, and then to a fully Americanized fishery. By the early 1990s, many of these now fully Americanized fisheries had fleets that could quickly harvest the total annual catch, and the competition among the vessels participating in these fisheries continued to increase (Strong and Criddle 2013). The resulting race-for-fish reduced the value of the landed catch, increased the risk of overharvest, increased risk-taking by fishermen, and reduced the economic viability of fishing. Consequently, the NPFMC began to explore fishery policies to discourage overcapitalization of the fishing and processing sectors and to reduce competition between fishing sectors. The NPFMC was concerned about potential adverse impacts on fishing communities if competition among fishing sectors led to a redistribution of landings and reduced demand for port services. In addition, the NPFMC was receptive to requests from villages along the Bering Sea coast for an opportunity to derive economic benefit from the groundfish fisheries occurring off their shores. Beginning in the early 1990s, the NPFMC adopted a suite of amendments to the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan to partition the total allowable catch among sectors in the pollock fishery. The NPFMC also implemented a Community Development Quota (CDQ) program under which 7.5% of the pollock total allowable catch (TAC) was allocated to six non-profit entities representing 65 western Alaska communities (total population ~27,000) (Ginter 1995).

Royalties earned from leasing the CDQs to commercial operators provided financial resources that have enabled the communities diversify their economic base and provided new opportunities for Alaska residents to participate in the BSAI fisheries (NRC 1998). Also, the production efficiencies available to vessels operating on leased CDQ contrasted starkly with the ever-worsening financial failure of the sector allocations that failed to end the intrasectoral race-for-fish (Strong and Criddle 2013). When the NPFMC was unable to devise a catch share program to address the concerns of fishermen and processors, industry representatives took the issue to Congress. The result was the American Fisheries Act (1998). The AFA subdivided the allowable catch of pollock between offshore and shore-based industry sectors and subsectors and allowed the formation of cooperatives to manage sector and subsector allocations.

During the 1990s and 2000s, most of the federally-managed fisheries off Alaska came under some form of catch-share or durable access right. CDQs were introduced to the pollock fishery in 1992 and subsequently expanded to include shares of all of federally managed Bering Sea fisheries, IFQs were implemented in the halibut and sablefish fisheries in 1995. The scallop fishery was closed to new entrants in 2000. IFQs and Individual Processor Quotas (IPQs) were implemented in the Bering Sea and Aleutian Island (BSAI) crab fisheries in 2005. Coop allocations were introduced in the Gulf of Alaska (GOA) rockfish fishery in 2007, in the BSAI groundfish trawl fishery in 2008, and the BSAI groundfish longline fishery in 2010. Faced with similar management challenges but without a legal option to create individual allocations, the State of Alaska began in 1973 to limit the number of participants in salmon, herring, and other oversubscribed state-managed fisheries. While restricted access management helped to make these federal and state fisheries more manageable and addressed some economic and social concerns, it changed the economic and social dynamics among fishermen, crew, processors, and their Alaskan communities.

The fourth chapter explores the attributes, successes, and failures of management measures intended to avoid or mitigate unintended community impacts of restricted access management in state and federal fisheries off Alaska. Implementing a catch share program is challenging and frequently controversial even though catch share programs are widely recognized by fishermen and fishery managers as a practical approach to end overfishing (Costello et al. 2008; Grimm et al. 2012; Melnychuk et al. 2016). Transitions to limited entry programs (LEP) or catch shares in different fisheries have impacted communities in various ways. While fishing and fishing-dependent economic activity has increased in some communities, many small remote rural Alaska communities have experienced a decline in their engagement in halibut, sablefish, and salmon fisheries in the wake of the transition from open access to limited entry or catch shares. Since catch share and LEP programs were implemented, policymakers have recognized this trend and have tried to assist communities with special programs, some of which have been successful, others less so.

While the fourth chapter focuses on community support measures introduced as amendments to the halibut and sablefish IFQ program, it also examines some of the other major commercial fisheries in Alaska

where community support measures have been introduced; these include the salmon, pollock, and crab fisheries. For example, the State of Alaska has developed loan programs for salmon commercial fishermen to purchase limited entry permits, as well as limited entry permits for other state fisheries and quota shares in federally managed fisheries. The goal of these programs is to promote the development of Alaska resident participation in commercial fishing. Unfortunately, it is often difficult for residents of remote rural communities to meet loan qualification requirements. In addition, restrictions intended to prevent the development of absentee ownership of fishing permits and quota and restrictions to forestall excessive consolidation generally preclude communities or non-profits from purchasing permits or quota shares or from qualifying for state-subsidized loans to purchase permits or quota shares for use by community members. The Alaska Board of Fisheries (BOF) has implemented several programs for the salmon fishery that are intended to foster local participation in fisheries, For example, the BOF has authorized permit stacking and dual permit operations to reduce financial barriers to entry. However, while the number of new entrants increased following implementation of the dual-permit regulation in the Bristol Bay drift gillnet salmon fishery, most of those new entrants have been non-residents.

Federal and state fishery managers have also devised management measures specifically intended to benefit rural fishery-dependent communities. The most successful of these programs is the CDQ program introduced above and discussed in more detail in Chapter 4. A second community program, the community quota entity (CQE) program, was authorized by the NPFMC and started in 2004 to help communities in Southeast Alaska and across the GOA region retain or regain engagement in the halibut and sablefish fisheries. Unlike the CDQ program, the CQE program did not begin with direct allocation of quota. Instead, it modified ownership restrictions of the halibut and sablefish IFQ programs so that qualifying CQEs could purchase and hold quota. The regulations named 42 communities eligible to participate in the program. As of 2019, however, only five communities have purchased halibut or sablefish quota (NOAA 2016).

The BSAI Crab IFQ program, implemented in 2006, provided for an Eligible Crab Community (ECC) program, patterned after the CQE program. As of 2019, none of the nine ECC eligible communities has taken advantage of this opportunity. In contrast, in the state/federal-managed Norton Sound red king crab fishery, the implementation of superexclusive registration requirements has advantaged local fishermen by increasing opportunity costs of participating in the Norton Sound fishery for large vessels that participate in the major Bering Sea crab fisheries. Superexclusive registration allows crab vessels to fish in this fishery only if they do not participate in any other commercial crab fishery (Greenberg and Herrmann 1994).

After a review of restricted access management programs and rural community protection measures, Chapter 4 turns to the development of a roadmap to help rural communities use existing programs and other innovations to sustain or reestablish their fishing fleets. Several steps could be taken to help these communities regain quota. For example, a first step might be to provide communities with readily accessible

descriptions of all the programs that are currently available and how the communities could take advantage of these opportunities. Some of the regulations are complex and have reporting requirements; accessible descriptions of program requirements could foster community participation. A second step might be to help communities identify and qualify for funding to support the acquisition of quota shares. A third step might be to help communities identify options for allocating fishing opportunities to community members and cost recovery of quota share acquisition.

Another avenue explored in Chapter 4 is the creation of fisheries trusts. Fisheries trusts are patterned after farm trusts, and other such land trusts structured to maintain traditional rural land uses and associated communities. There are several fisheries trusts in the United States, including a newly formed trust in Sitka, Alaska; these were all established to help small communities and fishermen gain entry into the limited entry fisheries.

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Chapter 2. "Development and Evolution of the Alaska Halibut and Sablefish Fisheries

Abstract

This Technical Memo describes and analyzes the evolution of the Alaska region Pacific halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria*) fisheries over the past 125 years. The development of these fisheries spans seven eras, each characterized by unique opportunities, challenges, and management innovations. The figures presented herein illustrate how these fish populations and fisheries have fluctuated in response to historical events that include the amount of fishing but also other aspects that have affected the fisheries.

The halibut fishery has been managed under science-based catch limits since the early 20th century (Thompson 1975; Bell 1981). Although stock levels and catches had declined in the 1960s and early 1970s, both recovered quickly following closure of the United States Exclusive Economic Zone to foreign fishing in 1976. During this time, exvessel prices were strong, but the season length was increasingly shortened to prevent overharvests. In 1975, the halibut season still lasted about 125 days; by 1980, the number and fishing power of active fishing vessels had greatly increased and the season had been reduced to about 25 days, yet harvests remained high at nearly 80 million pounds (IPHC 1990). By the late 1980s, thousands of halibut vessels raced one another in a 2-3 day derby. Similarly, the sablefish season off West Yakutat dropped from 200 days in 1984 to 50 days in 1985 and continued to drop to 10 days in 1994.

This extreme "race to fish" greatly reduced product quality, decreased vessel safety, and regularly resulted in excess harvests. There was broad consensus that change was needed, but there was little consensus about how best to change the regulation and management of the fishery. Top concerns of fishermen and managers included safety at sea, low exvessel prices, escalating operating costs, reigning in the number of vessels in the fishery, lengthening the season, and increasing management precision (Sigler and Lunsford 2001).

When individual fishing quota (IFQ) based management was first proposed for the halibut and sablefish fisheries in the late 1980s, there was considerable opposition from some fishermen (Pautzke and Oliver 1997) but other fishermen acknowledged that a change in management was needed for the fisheries to remain sustainable. Nevertheless, as the race-for-fish intensified in both fisheries, and after numerous public meetings and extensive analysis of alternatives, the North Pacific Fishery Management Council approved the Alaska halibut and sablefish IFQ program in late 1991 for initial implementation at the start of 1995. The program was intended to increase manageability of these fisheries and reduce the likelihood of overharvests while minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, maintaining a broad and heterogeneous distribution of quota share ownership, and preserving the owner-operator character of the fishery (Pautzke and Oliver 1997).

Designing, adopting, and implementing a catch share program is challenging and frequently controversial even though catch share programs are widely recognized as an effective approach to limit a fishery from being overfished (Costello et al. 2008; Grimm et al. 2012; Melnychuk et al. 2016). Program outcomes depend on the interplay between program design features and factors outside of management control. External market forces, externally driven variations in stock abundance and distribution, unexpected interpretations of the regulations, and unintended consequences—spillovers—affect program success and broader impacts. The Alaska halibut and sablefish IFQ program has been in operation for 22 years. In its design, policymakers took into consideration elements and outcomes of other IFQ programs from around the world. This foresight and planning have made the Alaska halibut and sablefish IFQ program more successful than some other catch share programs. Nevertheless, while the program has increased ex-vessel prices for halibut (Herrmann and Criddle 2006) and sablefish (Fell and Haynie 2011; Warpinski et al. 2016), it has redistributed value from processors to harvesters (Matulich and Clark 2003; Hackett et al 2005; Herrmann and Criddle 2006), and it has been cited as a contributing factor to the decline of remote fishery-dependent communities (Carothers 2008). The Alaska halibut and sablefish IFQ program has been repeatedly amended to remedy unanticipated and unintended outcomes and to address evolving social concerns. The outcomes of this program and its evolution provide lessons for the development and design of new IFQ programs for fisheries off Alaska, elsewhere in the United States and beyond.

Introduction

The Pacific halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria)* fisheries off British Columbia and Alaska are often held up as examples of how fishery resources overfished under derby-style exploitation can be rebuilt as high-value sustainable fisheries. Together, for 2017, the halibut and sablefish fisheries accounted for little more than two percent of landings (by weight) of the fisheries off Alaska but represented nearly 12 percent of total harvested value.

Halibut and sablefish are managed under separate authorities. The halibut fishery is managed under a bilateral treaty between the United States and Canada, and the International Pacific Halibut Commission (IPHC) conducts research and makes area harvest recommendations (McCaughran and Hoag 1992). Under the Northern Pacific Halibut Act of 1982 (Public Law 97-176), the North Pacific Fishery Management Council (NPFMC) is authorized to develop regulations that are in addition to, but not in conflict with, the regulations adopted by the IPHC. The NPFMC develops limited entry regulations and allocations for Alaska portions of the commercial and charter halibut fishery as well as the regulations for subsistence use. The National Marine Fisheries Service (NMFS) is responsible for developing, implementing, and enforcing regulations pertaining to the management of halibut fisheries within the United States territorial seas and Exclusive Economic Zone. The State of Alaska participates in management through representation on the NPFMC and the Alaska Department of Fish and Game (ADF&G) issues sport fishing and guide licenses, monitors and reports on sport and subsistence harvests, and assists federal agencies with the preparation of regulatory analyses.

The NPFMC and the Secretary of Commerce manage sablefish in federal waters off Alaska. Annual allocations of the sablefish total allowable catch (TAC) among gear groups (longline, pot, and trawl) have been ongoing since the 1980s. Sablefish has also been taken as bycatch, particularly in trawl fisheries. There is little recreational or subsistence fishing for sablefish. Sablefish are typically landed at shoreside plants or at floating processors in nearshore Alaskan waters, but a portion of the TAC is harvested and processed offshore by catcher processors (NPFMC 1989). Management of the domestic fishery has always been under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and subject to the NPFMC process. Sablefish TACs and allocations thereof are recommended annually by the NPFMC's Plan Teams and by the NPFMC for approval by the Secretary of Commerce. NMFS manages sablefish from three nautical miles to the 200 nautical mile limit of the United States Exclusive Economic Zone. A small portion of the sablefish fishery (out to three miles from the shoreline) is managed by the ADF&G under regulations and guidelines established by the Alaska Board of Fisheries. Some sablefish fisheries within state waters have been placed under limited entry permit (LEP) programs by the Alaska Commercial Fisheries Entry Commission. Other sablefish fisheries occurring in state waters remain open access, although IFQ permit

holders who participate in these open access state fisheries must record their landings under the sablefish individual fishing quota (IFQ) program, and any harvest is subtracted from their IFQ accounts.
Pacific halibut are a large bottom-dwelling long-lived species. They are harvested commercially using demersal longline gear at depths from 90 to 2,000 feet. Demersal longlines consist of gangions, leaders with baited hooks, attached to a weighted mainline deployed against the seafloor (Figure 2.1).

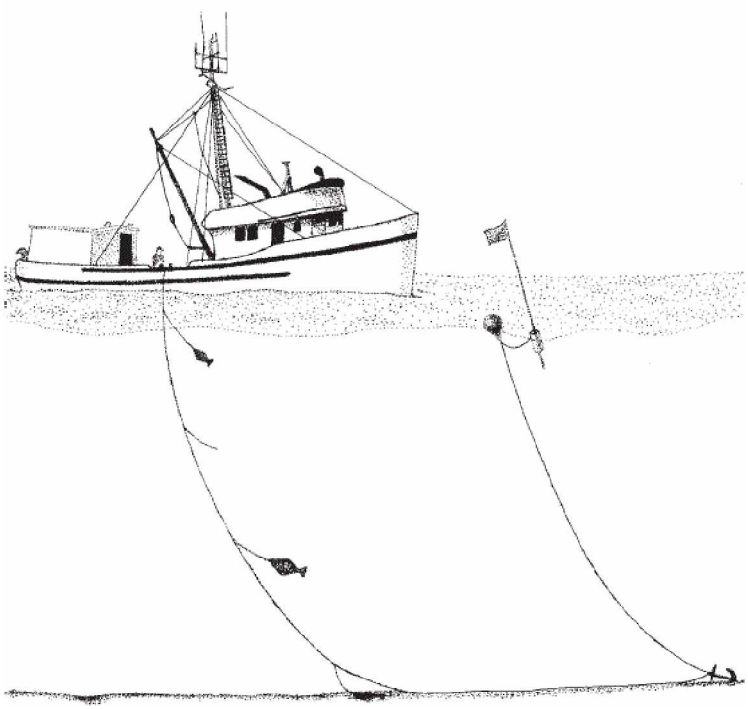

Figure 2.1. Diagram of a vessel retrieving a longline (IPHC)

Sablefish, also known as blackcod, is a soft-textured buttery-flavored fish found at depths from 450 to 6,000 feet in the North Pacific Ocean. While sablefish are found from Baja California to western Japan, they are most abundant off the coast of British Columbia and Alaska. They are a long-lived demersal (bottom-dwelling) species fished with demersal long-line gear similar to halibut gear, but are also fished with baited pots (traps), and trawls. The sablefish fishery is typically farther offshore and in deeper water than the halibut fishery and occurs outside the prime season for halibut. Sablefish average monthly harvests (percentage of total landings) are higher early in the season than are average monthly harvests of halibut; halibut monthly harvest peaks in June and remain high through August and September (NOAA 2012).
Halibut catches have fluctuated dramatically over the past 125 years (Figure 2.2). As the fleet became more mechanized and more efficient at finding halibut, it became increasingly clear that the fleet had the potential

to deplete the halibut stock unless catch was limited through effective management. As IPHC and academic researchers worked to understand the biology and population dynamics of the stock, managers worked to develop accurate and timely catch accounting measures and harvest controls. Establishment of a 200-mile Fisheries Conservation Zone (Public Law 94-265 1976) off the United States coastline in 1976 and implementation of the halibut and sablefish IFQ program in 1995 (NPFMC 1992b 1992) are watershed events that shaped the modern history of this fishery.

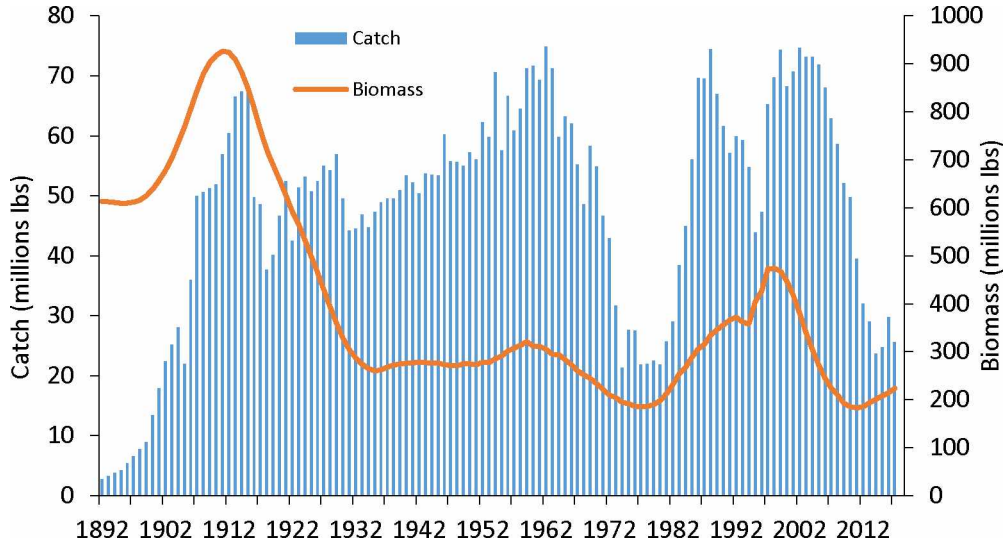

Figure 2.2. Total commercial catch and biomass (million pounds) of halibut, 1892 through 2017.

Fishermen based in the Pacific Northwest, British Columbia, and Alaska had high catches of halibut over 100 years ago (between 1911 and 1915) with average landings of 64.3 million pounds (Bell 1981; Figure 2.2). Between 1985 and 2010, halibut removals for the Pacific Coast were above the 100-year average at 63.5 million pounds and removals peaked in 2004 at 74.6 million pounds (Figure 2.2). Since 2004, halibut removals have declined substantially because of management measures intended to address concerns about declines in exploitable biomass. In2017, halibut allocations were reduced to 31.4 million pounds. This was less than one-half of the removals taken in 2002 (IPHC Annual report 2016).

The estimated biomass of halibut peaked in 1911, fell to low levels in the 1970s, climbed during the 1980s and 1990s, and declined from 1999 through 2010. Data from 2014 suggest that the population numbers have begun to level out. However, over the past four decades, the average size-at-age of halibut has declined (IPHC 2016 p. 68). For example, in 1997, a typical 14-year-old halibut weighed 55 pounds, while the same age halibut in 2014 averaged only 25 pounds.

In addition to the commercial catch, the halibut resource has four competing uses: subsistence (personal use); non-guided and guided (charter) sport fishing; bycatch- from other fisheries; and wastage—the mortality

(dead loss) of undersize halibut discarded by the commercial halibut and sablefish fisheries. Figure 3 shows changes in the distribution of total fishing mortality across these categories through time.

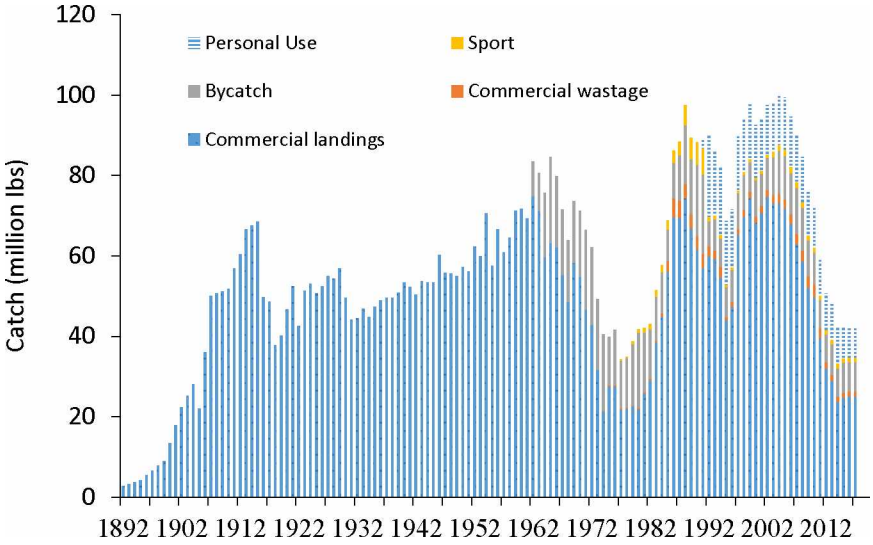

Figure 2.3. Total commercial catch (million pounds) by different sectors, 1892-2016.

The halibut IFQ fishery faces different management challenges in each area. For example, in Southeast Alaska, halibut fishermen catch a large amount of rockfish as bycatch in which effects there their population levels. Rockfish that are released have poor survival because of the barotrauma they incur on being brought to the surface. In the Gulf of Alaska (GOA), depredation by sperm whales and killer whales has become an increasing challenge for longline vessels. In the Bering Sea, catches of legal size halibut (32 inches or greater) are constrained by disproportionate numbers of undersized halibut.

The sablefish fishery developed as a secondary activity for United States and Canadian halibut fishermen. The fishery started in waters off Washington and British Columbia and, by the 1920s, extended along the Pacific coast from Northern California to Kodiak (Hanselman et al. 2016). In contrast to the halibut fishery, until 1978, the sablefish fishery was prosecuted almost entirely by foreign fishing vessels (Berger et al. 1986). The first domestic commercial landings in Alaska from this fishery were in 1958.

In 1964, Japanese longliners began targeted sablefish operations in the Eastern Bering Sea (EBS) and the fishery expanded rapidly with catches peaking at almost 52 million pounds by 1966. In addition, sablefish bycatch in other foreign fisheries off Alaska reportedly averaged 9.4 million pounds. Most of these sablefish harvests were from the eastern Being Sea until 1968, when Japanese harvesters switched their focus to the GOA. In the GOA, sablefish catches increased rapidly as the Japanese longline fishery expanded, peaking at 145 million pounds in 1972 (Figure 4). Catches in the Aleutian Islands (AI) region remained at low levels with Japan harvesting the largest portion of the sablefish catch in this area. Heavy fishing by foreign vessels

during the 1970s led to a substantial population decline. Limits were put on the expanding Japanese trawl fisheries inside the 12-mile United States territorial seas to stem excessive catches, but those limits did not apply outside United States waters and the Japanese continued to expand their longline fleet outside territorial waters in the AI region and in the Western GOA and Central GOA (Sonu 2014). With implementation of the FCMA, fishery managers gained authority to establish and enforce catch limits throughout the 200-mile FCZ off Alaska, which sharply reduced foreign catches.

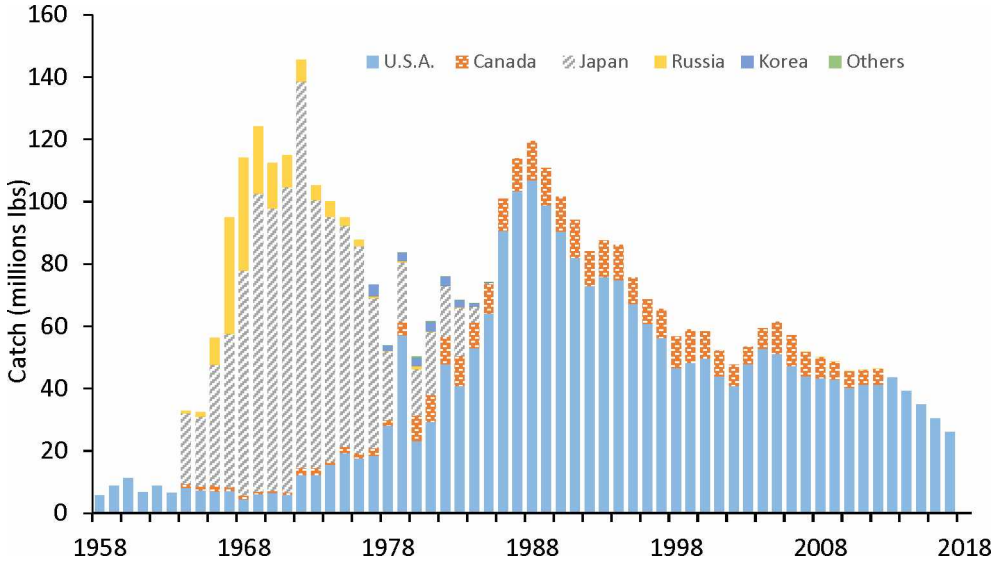

Figure 2.4. Foreign and domestic catches (million pounds) of sablefish, 1958-2017.

Catches in the sablefish fishery peaked at 117 million pounds in 1972 with a large proportion being caught by large trawl vessels; by 1978, catches had dropped to 20.1 million pounds (Figure 2.5).

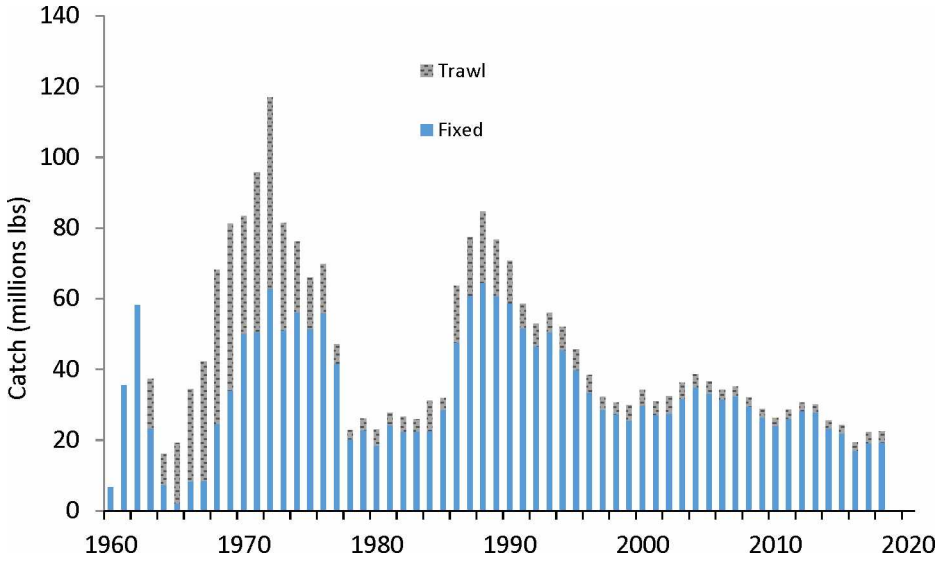

Figure 2.5. Total commercial trawl and fixed gear catches (million pounds) of sablefish, 1960-2017.

While a substantial proportion of sablefish was harvested by trawlers in the early history of the fishery, since Americanization in the 1970s, most of the TAC has been caught with hook-and-line or pot gear. Between 1960 and 1994, the sablefish TAC averaged 52.7 million pounds. Since 1995, when the sablefish fishery became an IFQ fishery, the TAC has averaged 31.4 million pounds. While biomass and catch fluctuated over this time (Figure 2.6), the overall trend shows declining biomass and catch so that by 2017, the total catch for sablefish off Alaska had declined to 22.5 million pounds (NOAA 2017, Hanselman 2016a.) In keeping with harvest control rules established in groundfish Fishery Management Plans (FMPs) for the GOA and the Eastern Bering Sea and Aleutian Islands (BSAI) regions, the overfishing limit (OFL) and acceptable biological catch (ABC) limits are proportionate to biomass and act as upper-bound limits for the TAC. The decline in sablefish biomass has leveled off in recent years, but commercial catches have continued to decline, in part due to underharvesting in the western GOA and AI regions (Figure 2.6).

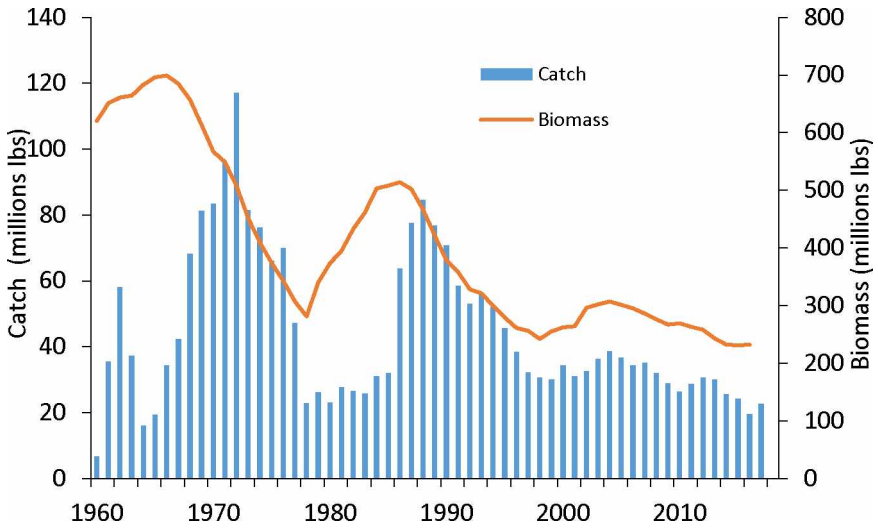

Figure 2.6. Total commercial catch and biomass (million pounds) of sablefish, 1960-2017.

Sablefish biomass has fluctuated substantially over the past six decades (Figure 2.6). Biomass peaked in 1965 through 1967, collapsed through the 1970s, remained at very low levels from 1978 through 1985, and recovered during the late 1980s before declining and remaining low ever since. Hanselman (2016a) has correlated historic trends in sablefish biomass with variations in average wintertime sea surface temperatures in the central North Pacific, finding that colder than average oceanic conditions correlate with above average recruitment events for sablefish. Recent research also suggests that sablefish recruitment is increased under ocean conditions that lead to summertime warm nearshore currents (Yasumiishi 2016). This is similar to ideal conditions for high productivity of pink salmon.

The sablefish IFQ fishery faces unique management challenges in each management area. In the EBS, killer whales depredation of fish on longline gear has been a problem since the beginning of the longline surveys. This depredation has expanded into the AI and Western GOA areas. Sperm whale depredation has mainly been a problem in Eastern GOA but has started to be more of a problem in the Central GOA and occasionally in the Western GOA (Hanselman et al 2014). Due to the increase in sperm whale and killer whale depredation, the NPFMC has relaxed restrictions that had limited the use of pot gear by IFQ permit holders. In addition, sablefish stock assessments now account for whale depredation (Hanselman et al 2016).

2.1 1880 through 1929: the Dawn of Halibut and Sablefish Fisheries in the Northeast Pacific

Halibut has been an important cultural and historical food source for indigenous inhabitants of the Pacific coast of North America. Even before commencement of commercial fisheries in the late 1800s, halibut was an important subsistence food fishery for the indigenous people who caught halibut from large canoes using hook and line methods (Newell 1994). It is estimated that the combined subsistence harvests of halibut exceeded 500,000 pounds per year in the late 1880s (NRC 1999a). In 1888, following commercial depletion of Atlantic halibut (*H. hippoglossus*) stocks, the west coast halibut resource began to attract fishermen and boats from the east coast of the United States, leading to development of the commercial fishery for Pacific halibut (Thompson and Freeman1930; Bay-Hansen 1991). The commercial fishery intensified and expanded in the 1890s when transcontinental railroads reached Seattle and Vancouver (Thomson 1975). Total commercial landings increased steadily over the next 27 years; in 1889, landings were over 1.8 million pounds, by 1904, they reached 28.8 million pounds, and in 1915, landings surpassed 68.5 pounds (Thompson and Freeman1930; Figure 2.7).

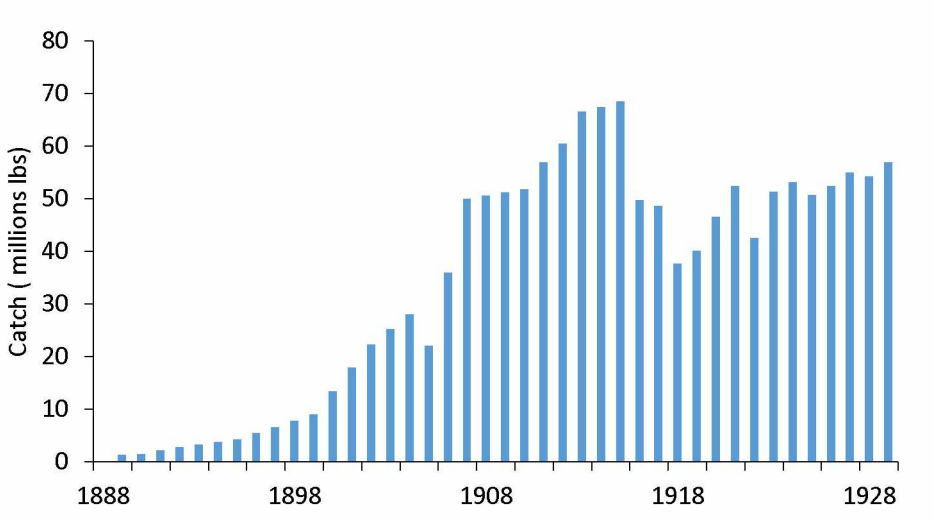

Figure 2.7. Commercial catch (million pounds) of Pacific halibut, 1888 through 1929.

A noticeable decline in halibut stocks in near-shore fishing grounds was first observed in 1910. This observation led the industry to lobby the United States and Canadian governments to enact conservation measure to protect the halibut stock (Clark 2003). The main areas fished for halibut in the 1880s were waters off Oregon, Washington, and California (Area 1 in Figure 2.8) and waters off British Columbia and Southeast Alaska (Area 2 in Figure 2.8). By 1921, diesel-powered vessels and mechanical devices for retrieving longline gear (Thompson and Freeman 1930) allowed the fishery to expand westwards across the GOA and into the EBS (Figure 2.8) (Thompson and Bell 1934; Thomson 1975). Total landings peaked at 68.5 million pounds in 1914 and 1915, followed by reduced harvests despite ever-increasing effort, suggesting that the fishery had begun to be overfished (Thomson 1975; Clark 2003).

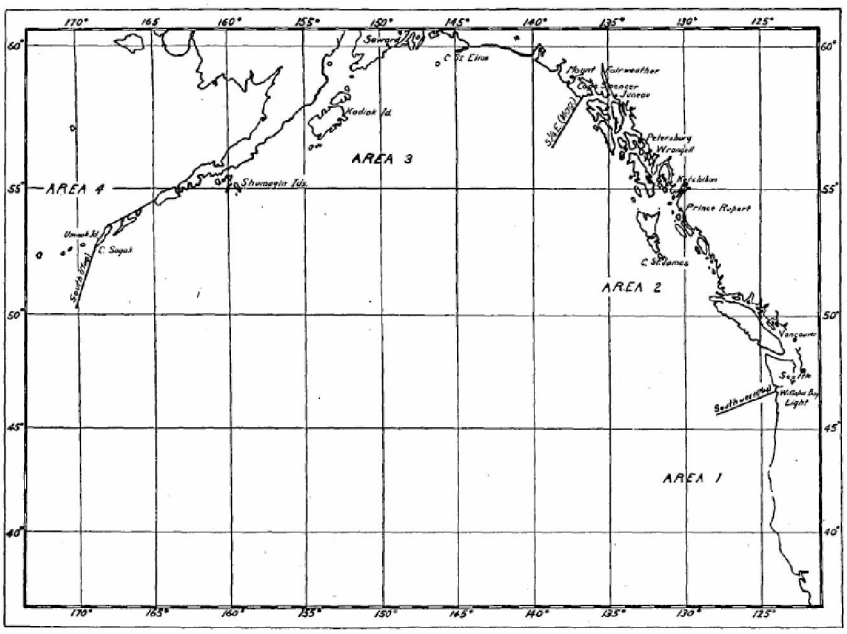

Figure 2.8. Map of the northeast Pacific coast showing early division into halibut regulatory areas.

The Pacific Halibut Treaty of 1923 and founding of the IPHC

The United States and Canada signed the Halibut Treaty of 1923 to address concerns about the conservation of Pacific halibut. This treaty established the International Fishery Commission (later renamed the International Pacific Halibut Commission, IPHC). The IPHC was tasked with investigating the halibut resource and recommending conservation measures (NRC 1999a). The Pacific Halibut Treaty was the first treaty to be concluded for the conservation of depleted deep-sea fisheries (IPHC 2003).

The IPHC hired William F. Thompson to lead research needed to fulfill its mission to develop science-based catch limits and catch accounting (Bell 1981). Within a few years, Thompson initiated a large and varied

program of field studies on halibut life history and compiled large amounts of data on fishing effort and catches (Thomson 1975, Clark 2003). One of the earliest conservation actions was instigation of a winter closure to protect spawning halibut. In 1930, Thompson recommended that the IPHC be granted authority to mandate catch reporting by management area and to specify catch limits in order to start rebuilding halibut stocks (Clark 2003). That authority was granted and, in 1932, the IPHC began setting annual harvest quotas. The IPHC was empowered to divide the fishery into management areas, to regulate the licensing and departure of vessels, to collect catch and effort statistics, and to regulate the types of gear that could be used in the halibut fishery (Wilen 1998). The IPHC also had the authority to close grounds populated with small immature halibut (Bell 1981).

Under Thompson, the IPHC staff developed methods to standardize landings records to better monitor catch and to ensure that the records would be comparable across management areas. Thompson started measuring halibut fishing effort in 1916, developing time series records of the number of dories, number of men and the amount of gear used each year. The IPHC adopted an 1,800-foot, six-line skate of gear as an initial standard unit for measurement of fishing effort. In 1940, this was revised to a standard of 120 hooks per skate (with 13-foot spacing) (Skud and Hamley 1978). The standard skate was subsequently revised to 1,800 feet of mainline with 100 hooks spaced at 18-foot intervals.

The weight of halibut caught per unit of effort (WPUE), an indicator of abundance, is calculated by taking the sum of the catch (in net pounds) of halibut per standardized skate of longline gear per standardized soak time of at least five hours (IPHC 2012). The WPUE is used to compare catch rates between years in the annual IPHC setline survey and to compare with catch rates in the directed commercial fishery to identify temporal trends for the stock as a whole and across regulatory areas (IPHC 2016). Figure 9 shows a marked decrease in WPUE from 280 pounds-per-skate-soak in 1907 to 55 pounds-per-skate-soak in 1929, an 80 percent decrease. This reduction in WPUE suggested that despite steady catches, fishing pressure was reducing halibut abundance.

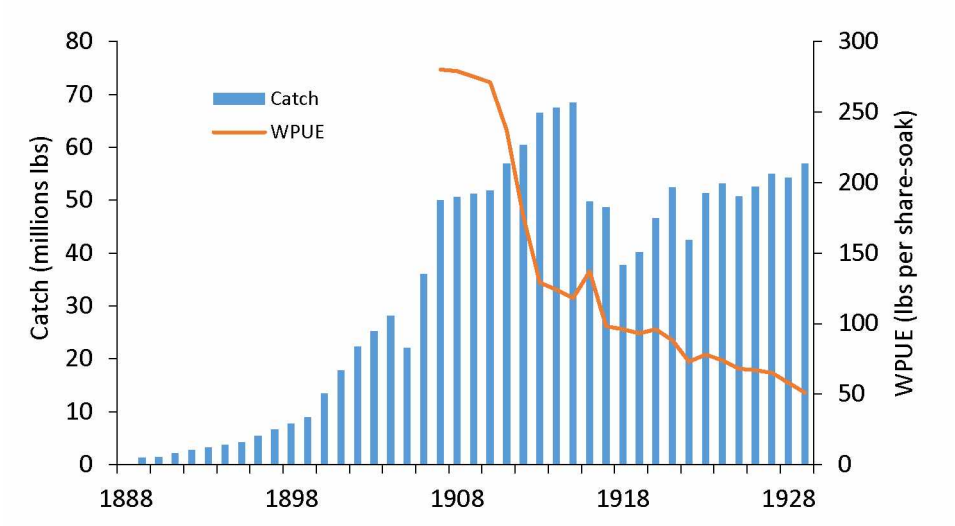

Figure 2.9. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1888-1929.

Sablefish fisheries in the 1920s

The sablefish fishery developed as a secondary activity for the halibut fishermen in the United States and Canada. The initial fishery started in Washington and British Columbia and by the 1920s had extended along the Pacific coast from northern California to Kodiak (Hanselman et al. 2016). Compared to the halibut fishery, the sablefish fishery occurs in deeper-water, with fishing concentrated at depths from 1,200 to 3,000 feet, typically farther offshore and primarily outside the peak season for halibut. A small domestic market for sablefish developed during this period.

2.2 1929 through 1944: the Advent of Science-Based Management of Halibut and Sablefish Fisheries

From 1929 through 1944, halibut stocks recovered from 25 pounds per skate-soak to 110 pounds per skate-soak (Figure 2.10). The recovery was attributed to effective science-based management and accepted as evidence that while excessive fishing effort could deplete a stock, sound science-based management could restore and maintain a healthy stock and support a substantial and sustainable fishery (Thomson 1975; Desharnais 2001; Clark 2003).

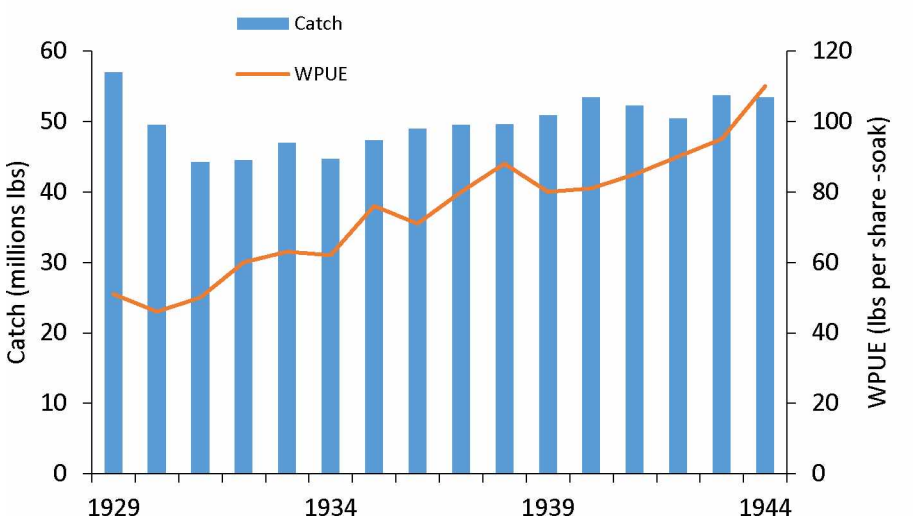

Figure 2.10. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1929 through 1944

Between 1934 and 1944, Thompson's analysis of WPUE was used to drive catch limit recommendations. These recommendations are considered to be among the earliest examples of science-based management, in that they were derived from a population model that was used to investigate the dynamics of the stock, the effects of fishing the stock, and the effect of regulations on the fishery (Clark 2003). Figure 2.10 indicates that catch also increased during this period, suggesting that fishing was becoming more efficient, in part, because the stock was increasing. In retrospect, it is apparent that natural fluctuations in productivity also contributed to the recovery (Burkenroad 1948, Clark and Hare 2002). Another factor on the stock rebound was that the fishery pressure was lower during World War II, because of the resources (vessels and personal) that went to the war.

In the 1930s, the Pacific halibut fishing grounds were divided into 30 statistical areas (Figure 2.11) to better track trends in catches across the biogeographic distribution of the stock (Thompson and Bell 1934).

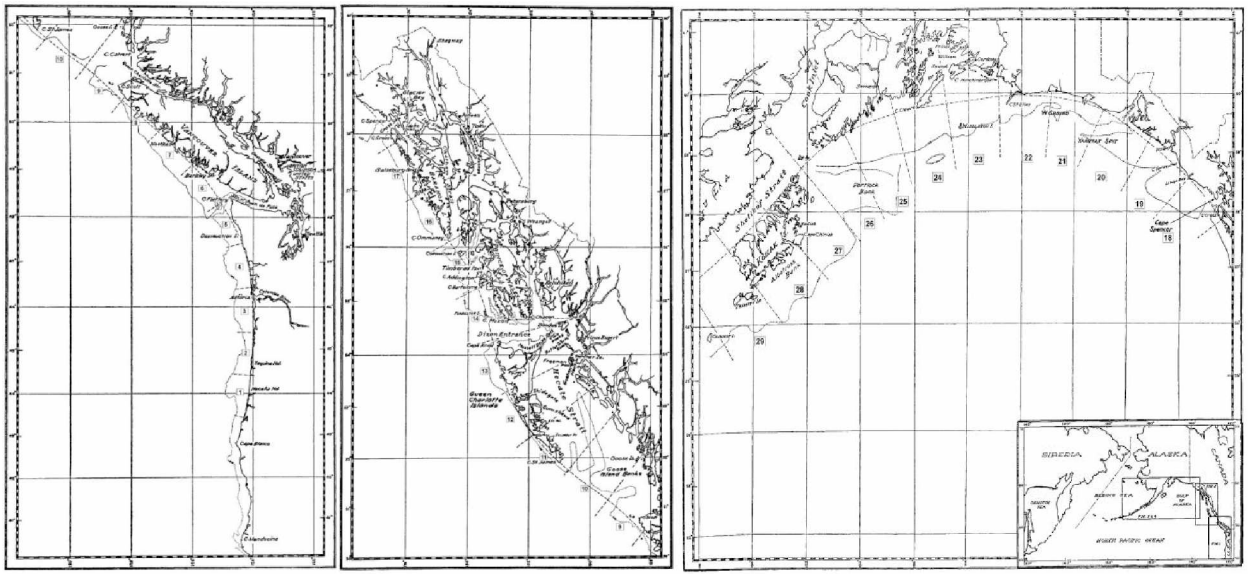

Figure 2.11. IPHC Statistical Areas in Northern British Columbia, Southeast Alaska, and the GOA, 1931.

The halibut commercial fishery was becoming a part-time fishery for many vessels as early as the 1930s. In the 1930s and 1940s, small salmon gillnetters and trollers entered the fishery targeting halibut just before and after the salmon season (Thomson 1975; Hartley and Fina 2001). Bycatch of halibut in trawl fisheries rose to about 800,000 pounds in 1943 (Thomson 1975). Removals between 1929 and 1944 held steady at about 50 million pounds, with a majority of catches coming from the GOA (40 percent), followed by British Columbia (30 percent), and Southeast Alaska (16 percent).

From 1929 through 1944, the sablefish fishery remained relatively small, and was almost exclusively a United States and Canadian fishery annual catch averaged around 3.7 million pounds, mostly taken near established fishing ports (Hanselman et al. 2016), but this fleet also retained up to one pound of halibut for every seven pounds of sablefish (Thomson 1975).

World War II and the Alaska halibut fishery

WWII disrupted many of the fishing activities in Alaska, including the commercial halibut fishery. Thomson (1975) notes that the Department of Navy relaxation of layover requirements for halibut fishing vessels led to a shift in deliveries to remote ports nearer to the fishing grounds and an acceleration of harvests that made the fishery less manageable. In 1942, two halibut vessels were commandeered by the Navy and credited with sinking a Japanese submarine. The submarine was first sighted in Dixon Entrance in June 1942 by a Royal Canadian Air Force bomber, which dropped a 250- pound anti-submarine bomb. The submarine disappeared for a few days but was sighted two days later by two halibut vessels, the *F/V McLane* and the *F/V Formost.*

During the ensuing 10-hour chase, the two fishing vessels dropped depth charges and were narrowly missed by a least one torpedo. The torpedo crossed the bow of the *F/V McLane* as it was backing away from the *F/V Formost*, which it had been following. Afterwards, both vessels dropped depth charges and the *F/V Formost* rammed the submarine. Sinking of the submarine was credited to both vessels (Chandonnet 2008).

2.3 1945 through 1960, Halibut and Sablefish Fisheries in a Golden Age

Following the end of World War II, halibut WPUE and commercial removals steadily increased, peaking at 72 million pounds in 1960 (Figure 12).

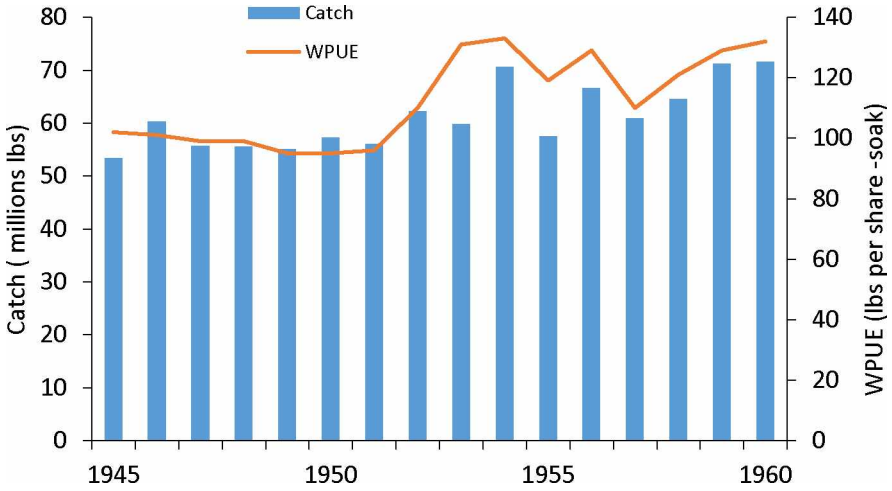

Figure 2.12. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1945 through 1960.

As the halibut stock continued to improve, new vessels were attracted to the fishery. Many of these vessels came from the salmon fleet and usually fished in May and June before focusing on salmon during July and August. As a result, fishing effort increased during those months and the fishing season for halibut became ever shorter. In addition, the Canadian government subsidized vessel replacements, increasing fishing power and further exacerbating harvest capacity (Bell 1970). By 1953, the halibut season in the GOA had been reduced to 52 days; by 1954 in British Columbia and southeastern Alaska, the open season was reduced to 21 days (IPHC 1987). In their detailed monograph on the halibut fishery, Crutchfield and Zellner (1962) expressed concern that rising fleet capacity would dissipate economic value and push the fishery into an unmanageably short race-for fish. Similarly, Comitini and Huang (1967) found evidence of economic decline in the halibut fishery, an indication that the fishery was not sustainable as a social-ecological system. However, because WPUE continued to increase, rising nearly 22 percent during this period (Figure 2.12), the IPHC was unconcerned (Desharnais 2001), interpreting the increase as evidence of effective science-based

management. During this period, the majority of the halibut were caught in the GOA (Area 3A; 38 percent), followed by British Columbia (Area 2B; 30 percent), and Southeast Alaska (Area 2C; 17 percent).
In the late 1950s, Japanese and other distant water fleets began to harvest pollock, flatfish, and Pacific ocean perch from the EBS and GOA. Over the next two decades, the global marine fisheries increased 300 percent. Fishing off the coast of Alaska by Japanese and other distant waters fleets dramatically increased (Bailey 1992). As they did so, halibut and sablefish bycatch rapidly increased (Thomson 1975; Hoag and French 1976; Sullivan 1994; Hanselman et al. 2016).

2.4 1961 through 1976: Unconstrained Foreign Fishing and Burgeoning Domestic Capacity in the Halibut and Sablefish Fisheries in the Northeast Pacific

By the 1960s, halibut stocks were thought to be in decline, leading the IPHC to reduce catch limits (Bell 1970). However, because halibut prices continued to increase, more small vessels were attracted to this fishery from the salmon fishery, which had begun to transition from open access to limited entry (Hartley and Fina 2001). Commercial halibut landings dropped substantially between 1961 and 1976 from about 70 million pounds to 27 million pounds (Figure 2.13). In 1961, IPHC began to estimate halibut bycatch in fisheries for other species; bycatch mortality is estimated to have averaged 14.83 million pounds per year during this decade. During this same period, WPUE declined 56 percent, from 127 pounds per skate-soak to 55 pounds per skate-soak (Figure 2.13).

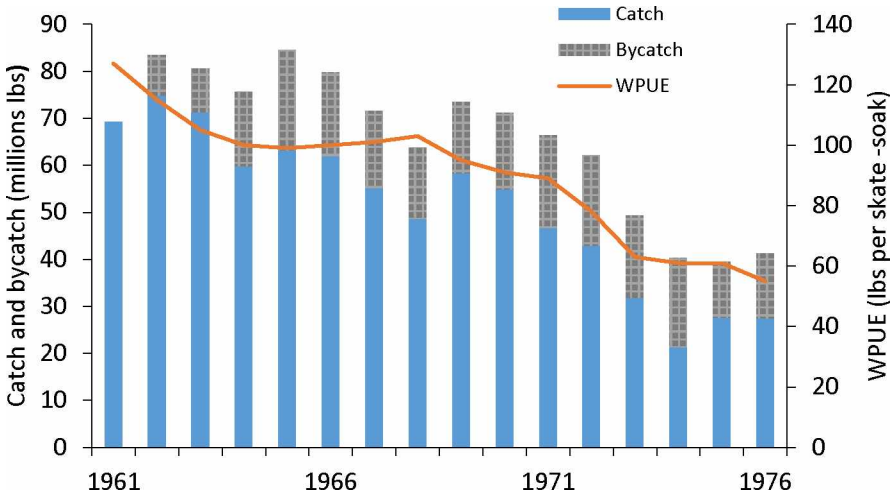

Figure 2.13. Commercial catch and bycatch (million pounds), and WPUE (pounds per skate-soak) of halibut, 1961-1976.

The IPHC was in a careful balancing act in regulating the halibut fishery, they wanted to achieve the maximum sustainable yield – but at the same time, the IPHC realized that abruptly changing the season length

would burden the fleet (Wilen 1998). Consequently, the IPHC chose to lower the quota slowly in an attempt to balance the two goals (Wilen and Homans 1998).

Domestic sablefish catches increased from 1964 through 1972 in response to reductions in foreign fishing (Figure 2.14).

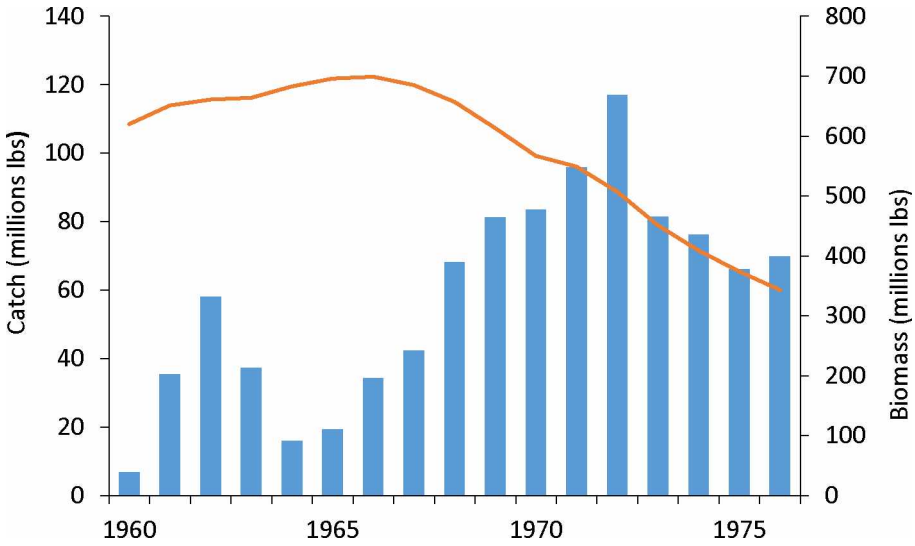

Figure 2.14. Catch and biomass (million pounds) of sablefish, 1961 through 1976.

Also during this period, shore-based trawlers began to target sablefish, catching an average of 15 million pounds per year between 1964 and 1972 (Figure 2.15; Hanselman et al. 2016).

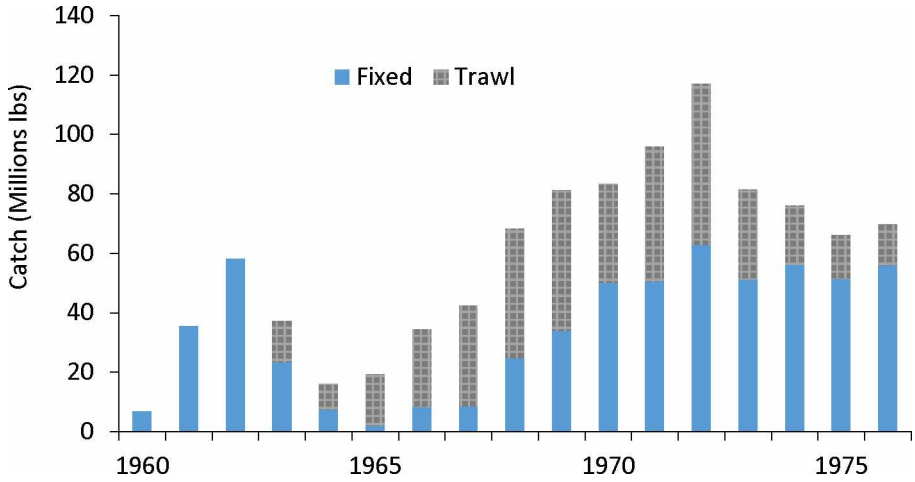

Figure 2.15 Sablefish catch (million pounds) in fixed gear and trawl fisheries, 1960 through 1976.

Between 1960 and 1976, a large portion of the sablefish TAC was caught as bycatch by trawlers fishing in United States territorial seas off Alaska. This caused a decline of catch available for the directed sablefish fishery during this period.

2.5 1976 through 1991: Halibut and Sablefish Fisheries under Extended Jurisdiction

In 1976, President Gerald Ford signed the Fisheries Conservation and Management Act (Public Law 94-265), now known as the Magnuson-Stevens Fishery Conservation and Management Act or MSA (Public Law 109-479). This extended the United States marine waters jurisdiction from the state waters boundary of three nautical miles offshore[1] to 200 nautical miles off the United States coast. Fisheries management in the United States is an amalgam of overlapping authority of federal and state governments, international treaties, interstate compacts, and tribal agreements (Criddle 2008). State fisheries management agencies regulate marine fish populations in state waters within three miles of shore1 as well as in lakes and rivers abutting state lands. The United States Fish and Wildlife Service manages fish species in lakes and rivers encompassed by federal land. NMFS has jurisdiction for fish and shellfish from the edge of state waters to the outer boundary of the EEZ. The MSA created a co-management structure wherein eight regional fishery management councils (RFMCs) represent public interests in recommending the design and modification of FMPs for fisheries within their region. These RFMCs include representatives nominated by the governors of each state in the region and are appointed by the Secretary of Commerce (NPFMC 2012), providing an avenue for representation of state interests in adjacent federal fisheries. RFMC members are intended to represent all stakeholders and include personnel from state fishery management agencies, the public, commercial and recreational fishing interests, non-governmental organizations, academic institutions, consumers, and other stakeholders. Because Pacific halibut are subject to a treaty between the United States and Canada, authority for management of the halibut stock through limits on allowable levels of fishing mortality resides with the IPHC, which includes equal representation from the United States and Canada.

Halibut and sablefish fisheries management under the MSA

Enactment of the MSA did not replace the Halibut Treaty; it expanded the geographic area subject to IPHC jurisdiction to more fully encompass the halibut population. The IPHC continues to be responsible for biological aspects of management, including stock assessments, regulations, and annual catch limit (harvest) specifications. Until 1979, Canadian and United States fishermen had full access to the fishery. In 1979,

[1] Except in the Gulf of Mexico where some state waters extend to 3 leagues (approximately 9.2 miles).

Canada and the United States signed a protocol extending the IPHC management and, starting in 1981, confining halibut fishermen to their own EEZs (Cook and Copes 1987).

In the late 1980s, the IPHC restructured its management map, consolidating the 30 statistical areas into 10 management areas (Figure 2.16). The IPHC uses logbooks, State of Alaska fish landing tickets, and biological samplers to collect data on the Pacific halibut resource. The IPHC also shares an interagency electronic landings reporting system (IERS) with NMFS and the State of Alaska that provides near-real time data on commercial landings. The State of Alaska collects and shares data on sport and subsistence catches of halibut.

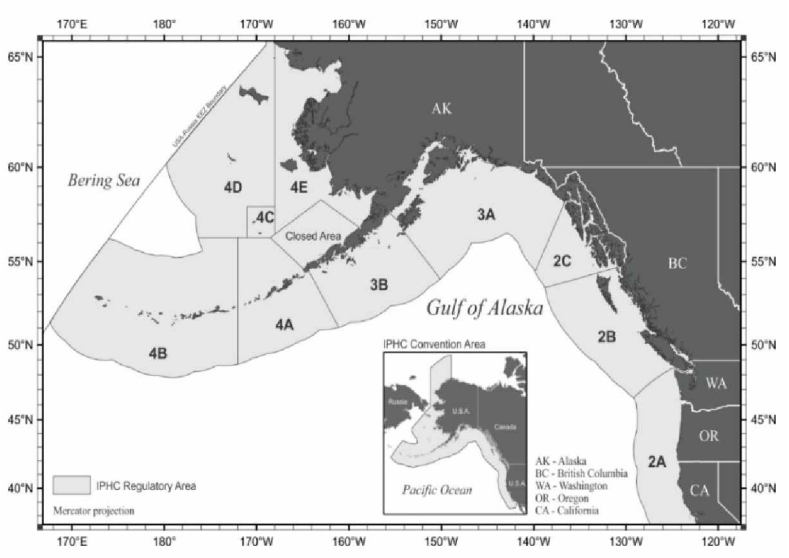

Figure 2.16. IPHC Regulatory Areas. (Source: IPHC).

Pursuant to its responsibility under the FCMA, the NPFMC drafted FMPs for groundfish of the GOA (1976) and for the BSAI (1979)[2]. These FMPs include sablefish and designate six sablefish management regions (EBS, AI, Western GOA, Central GOA, West Yakutat, and Southeast Outside) for sablefish fisheries off Alaska (Figure 2.17).

[2] FMPs are subject to periodic review and revision; the current BSAI groundfish FMP is (NPFMC 2017a), the current GOA groundfish FMP is (NPFMC 2017b).

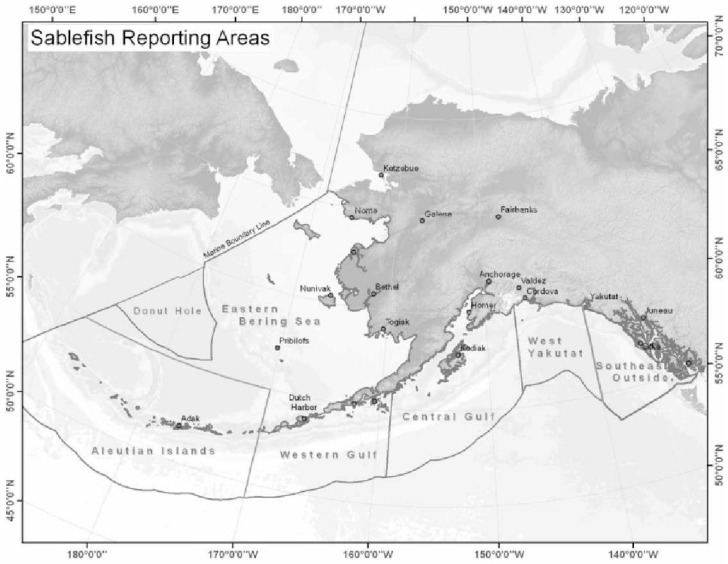

Figure 2.17. Sablefish reporting areas and quota share area designations. (Source: NMFS).

Halibut and sablefish fisheries under the MSA From 1976 through 1994, the halibut and sablefish fisheries remained open access to United States fishermen, meaning that any federally permitted fishing vessel could fish for these species. Because of open access, these stocks were subjected to localized depletion and general overfishing (Hanselman et al. 2016). Particularly so after 1980, when Bering Sea crab stocks were overharvested and larger crab vessels entered the halibut and sablefish fisheries (IPHC 1987). Whenever other fisheries (such as salmon) had a decline in their target stock, the halibut fishery seem to be an easy fishery to add to their season (Hartley and Fina 2001). This led to additional vessels fishing for halibut each season. However, in the wake of the MSA, halibut biomass began to increase (Figure 2.2) and so did WPUE (Figure 2.18). Pressure from the added vessels did not immediately affect catch rates.

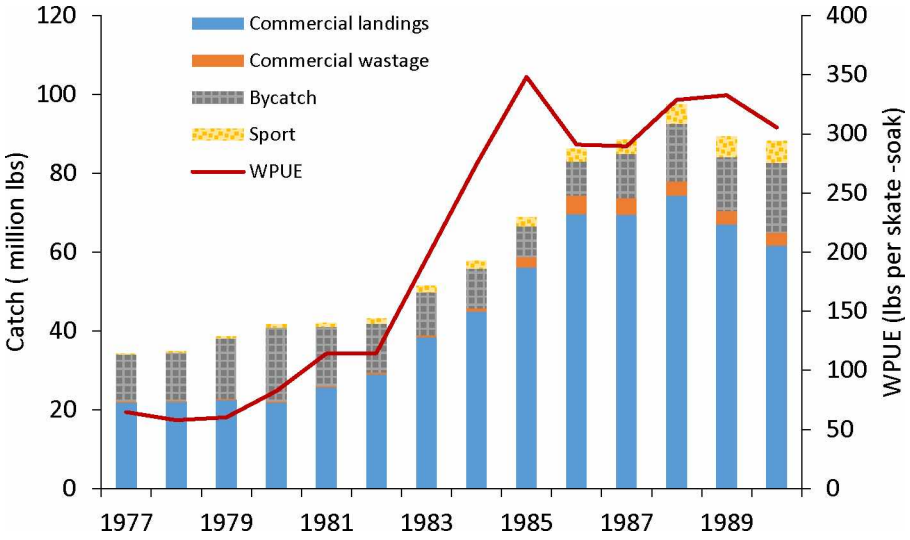

Figure 2.18. Catch (million pounds) and WPUE (pounds per skate-soak) of halibut, 1977 through 1990.

Commercial landings rose from 22 million pounds in 1977 to 74 million pounds in 1988 (Figure 2.18). During this time, the management agencies also began to pay closer attention to halibut mortality outside of the directed fishery. During this period, bycatch[3] averaged 12.9 million pounds per year, sport catches averaged 2.3 million pounds per year, and commercial wastage (predominately the mortality of undersized halibut discarded at sea) averaged about 1.8 million pounds per year (Figure 2.18). During this same period, halibut WPUE rapidly increased to 350 pounds per skate-soak and then dropped to 300 pounds per skate-soak (Figure 2.18). Once again, most of the halibut was caught in the eastern and central GOA (Area 3A; 42 percent) followed by British Columbia (Area 2B; 18 percent), the EBS (Area 4; 15 percent) and Southeast Alaska (Area 2C; 13 percent).

The sablefish fishery also increased its catch between 1977 and 1990 (Figure 2.19), with United States fishing vessels displacing foreign fishing vessels (Hanselman et al. 2016). Foreign fisheries caught between 17.5 million pounds and 28.6 million pounds of sablefish per year from 1977 through 1983; thereafter, foreign catches declined and ceased altogether in 1987 (Hanselman et al. 2016). Meanwhile domestic catch rapidly increased to a record harvest of 82.9 million pounds in 1988 before declining. Most of the sablefish catch was in the GOA where longliners harvested just over 64.5 million pounds of the 85 million pounds caught in 1988.

[3] Under the groundfish FMPs for the GOA and BSAI, bycatch, the incidental catch of halibut in non-target fisheries, is categorized as prohibited species catch. That designation means that bycatch of halibut cannot be retained and provides a basis for establishment of prohibited species caps that, if exceeded, can close fisheries that are unable to avoid halibut bycatch. For simplicity, throughout this document, the generic term "bycatch" will be used in lieu of "incidental catch" or "prohibited species catch".

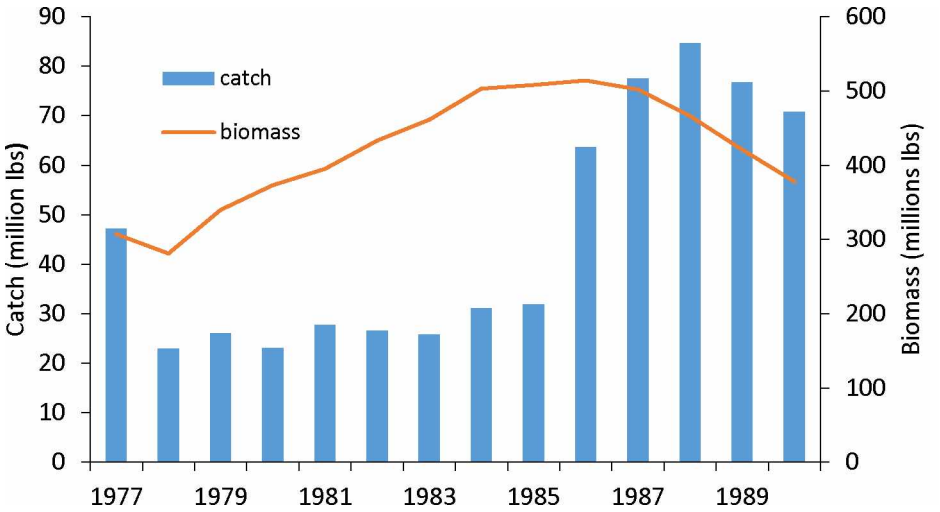

Figure 2.19. Catch and biomass (million pounds) of sablefish, 1977-1990.

Domestic capacity in the sablefish fishery increased rapidly during this period. Between 1981 and 1988, there was a tenfold increase in vessels over 50 feet in length and a 14-fold increase in smaller vessels engaged in the sablefish fishery (Hanselman et al. 2016).

Transition to IFQs for sablefish and halibut

During the late 1970s, the NPFMC began exploring ways to implement a limited entry program for the halibut fishery off Alaska. Those initial efforts were derailed over uncertainty about the roles of the IPHC and NPFMC in management of the halibut fishery (Pautzke and Oliver 1997). The ambiguity was resolved by the 1979 Protocol to the Convention and the Northern Pacific Halibut Act of 1982 (McCaughran and Hoag 1982). The protocol reaffirmed IPHC authority over stock assessment and annual catch limits but allowed each nation to impose additional regulations (McCaughran and Hoag 1982). The Northern Pacific Halibut Act, specifically delegated authority for allocation and management of the fishery to the NPFMC (Public Law 97-176). With its new authority, the NPFMC voted to implement a three-year moratorium on entry to the halibut fishery. The proposed rule was published in the *Federal Register* on February 3, 1983 (48 FR4861). Based, in part, on an unfavorable review by the Office of Management and Budget (OMB), the Secretary of Commerce rejected the moratorium. The OMB argued that a moratorium, *per se*, would not end the race for fish and thus fail to achieve long-term benefits that could be achieved through establishment of an IFQ (Richards and

Gorham 1986). The OMB's findings and recommendation echoed theoretical analyses (Moloney and Pearse 1979; Wilen 1979; Pearse 1980; Stollery 1986) and empirical reviews (Muse and Schelle 1989; Terry 1993). The problems that led to the development of the 1983 halibut fishery moratorium proposal continued to worsen through the 1980s. Barriers to entry in the halibut fishery were low. The season was very short (in some areas as little as three to four days; Figure 2.20) and halibut fishing required little unique skill or knowledge. As soon as the sablefish fishery was fully domesticated, the longline fleet asked the NPFMC to revisit a moratorium coupled with a limited entry system (Pautzke and Oliver 1997). Initial discussions focused on the sablefish fishery and did not include a parallel proposal for the halibut fishery. The NPFMC considered a variety of input controls (e.g., license limitations, gear restrictions) as well as allocated quotas. Because almost any vessel could be used as a platform for halibut fishing, including open skiffs, sport charter vessels, salmon troll, gillnet, and purse seine vessels, traditional halibut schooners, and repurposed crabbers, anyone could purchase a few skates of longline gear and join the fleet. By the mid-1980s, the halibut and sablefish fisheries were both characterized by overcapacity, validating concerns expressed by Crutchfield and Zellner (1962) and Comitini and Huang (1967), among others. During this time, the fishery included about 3,500 halibut vessels and 1,800 sablefish vessels, and the season had decreased from months in the 1970s to mere days for halibut and mere weeks for sablefish (Figure 2.20).

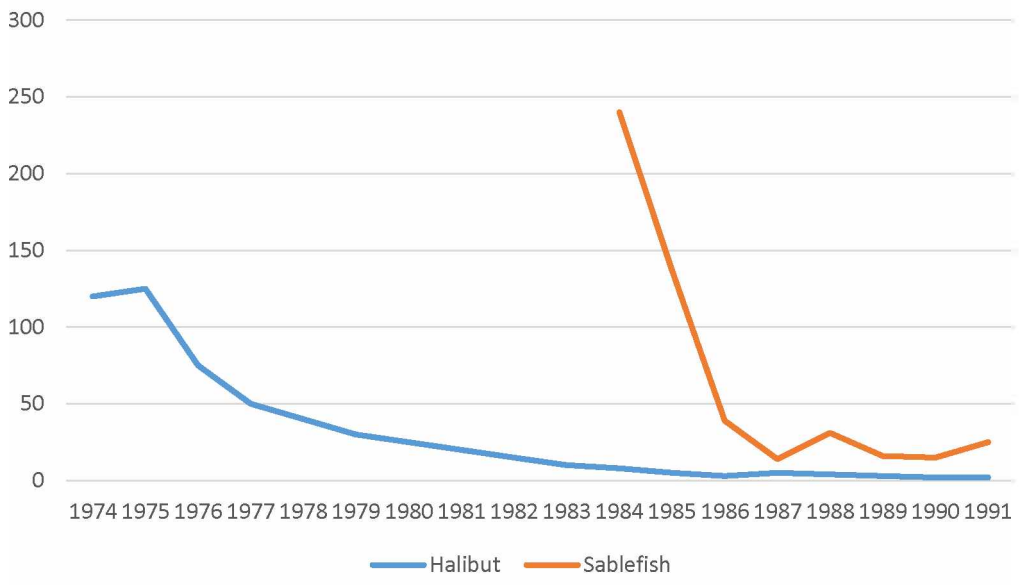

Figure 2.20. Season length (days) in the halibut sablefish fishery, 1974 through 1991.

Both fisheries were experiencing high bycatch, lost gear, grounds congestion, compressed seasons, and high discard mortalities (Pautzke and Oliver 1997). In addition, a high incidence of death and injury could be attributed to the derby style fishery (Hughes and Woodley 2007).

It was apparent to fishermen that some flavor of limited entry permit (LEP) program or IFQ program would eventually be recommended by the NPFMC and approved by the Secretary of Commerce. Fishermen widely expected that, like Alaska's LEP programs, these LEPs or IFQs would be awarded free to recipients based on their documented engagement in the fishery and that they would be awarded in perpetuity as transferable usufructs which would create windfall gains that could be realized on sale (Newell et al. 2007). These anticipated features attracted new fishery entrants and induced longtime participants to delay retirement and created a clear economic incentive for fishermen to "fish for catch history" (Anderson and Hill 1990). In the years leading up to adoption of the IFQ program, some participating vessels incurred operating costs and amortized fixed costs in excess of their annual earnings in the halibut fishery but continued to fish to demonstrate engagement in the fishery and to acquire catch history (Criddle 1994).

While rejection of the proposed moratorium was a setback, by 1985, the NPFMC was exploring implementation of a LEP program for sablefish in the GOA (NPFMC 1985). The NPFMC also established ad hoc committees to explore strategies for limiting entry to the halibut fishery. Among other measures, the NPFMC considered limiting access in portions of the Bering Sea around the Pribilof Islands to provide economic opportunity to island residents. The NPFMC examined additional alternatives in draft environmental assessments for limited access in halibut (NPFMC 1987) and sablefish (NPFMC 1989). In 1990, the NPFMC initiated an analysis of alternatives for management of both fisheries with a moratorium on entry to be followed by implementation of a license limitation or IFQ program. That analysis developed into an Environmental Impact Statement of proposed amendments to the BSAI (Amendment 15) and GOA (Amendment 20) groundfish FMPs for the IFQ management alternative for fixed gear sablefish and halibut fisheries (NPFMC 1991a,b,c;1992a,b).

Stakeholders were concerned that a moratorium coupled with LEPs or IFQs would lead to consolidation and a reduction in seasonal crew and skipper positions, thus harming fishing communities; constitute a "give-away" of public resources and create a closed class of privileged constituents who would gain undue economic power; create unfair "windfall" gains for recipients who had established long catch histories in the halibut and sablefish fisheries; and, be difficult to enforce and that LEP or QS recipients would have an incentive to high-grade and under-report their catches. Proponents argued that beneficial impacts would include improved safety at sea; an extended fishing season; increased availability of fresh fish and increased product quality; increased ex-vessel value to fishermen; reduced capitalization and surplus capacity; and greater economic self-determination for fishermen. To a greater or lesser extent, all of these concerns and beneficial impacts have been validated in the ensuing years.

By 1991, the NPFMC settled on a recommendation for the implementation of an IFQ program for both sablefish and halibut. The NPFMC passed this recommendation on a seven to four vote. The preferred

alternative included many previously untested design features intended to allow for needed consolidation without loss of essential social characteristics of the fishery (Cotter 2011). Following this action, the NPFMC formed an agency advisory committee that consisted of representatives of the Alaska Commercial Fisheries Entry Commission, which had experience designing and implementing limited entry fisheries for salmon, herring, and miscellaneous species in state waters, the NMFS, which had statutory authority for management and enforcement of the fisheries, and the ADF&G which had dockside sampling capacity and experience collecting fish ticket data on ex-vessel transactions. The NPFMC also formed an industry advisory committee. These two committees looked at different IFQ implementation options, one committee from the perspective of biologists and professional managers and the other from the perspective of industry. Both committees met periodically to exchange ideas of what the fishermen wanted and what the agency representatives believed to be feasible. The advisory committee process worked out detailed plans for an electronic ledger reporting system involving both harvesters and processors, which would deduct landings from individual quota share accounts in real time and guard against overages and underreporting (Cotter 2011).

Based on analyses reported in the final environmental impact statement in 1992 (NPFMC 1992b), the new IFQ program was expected to distribute fishing over an 8-month season, allowing fishermen to harvest their individual quotas at opportune times when they were assured of high ex-vessel prices, low opportunity costs, and increased profits. It was also expected that the IFQ program would reduce the need for search-and rescue-operations; reduce gear conflict and congestion on the grounds, thereby reducing gear loss and ghost fishing mortality; and allow vessels fishing both sablefish and halibut IFQ to retain target and bycatch species, thereby reducing discard mortality of both species. Those who held the IFQ could determine where and when to fish, how much gear to deploy, and scale their overall investment in harvesting capacity to match their IFQ holdings.

In 1992 the NPFMC submitted a detailed environmental impact statement and its preferred alternative for a comprehensive halibut and sablefish IFQ program and FMP amendments for the sablefish fisheries (Hartley and Fina 2001). NMFS then prepared a proposed rule for Secretarial approval of the Alaska Halibut and Sablefish IFQ program and authorization to publish the plan in the Federal Register (NPFMC 1992). Following public comment and publication of a Final Rule with final implementing regulations, NMFS opened an application period in January 1994; in January 1995, the halibut and sablefish IFQ program was approved for implementation.

2.6 1991 through 1994: the Final Years of Open Access in the Halibut and Sablefish Fisheries off Alaska.

The period from 1991 through 1994 was very unsettled. While the NPFMC moved forward with design of the halibut and sablefish IFQ program and development of an implementation plan, litigation over aspects of the

plan and especially over qualification criteria (e.g., Black 1996) uncertainty about whether the IFQ program would be upheld by the courts and whether the NPFMC's preferred alternative would be implemented as intended. In addition to challenges in federal court, there were concerns that IFQ program might not apply in state waters (Alaska Department of Law 1995). Ultimately, the IFQ program for halibut was upheld as applicable to commercial catches in state waters under authority of the Halibut Treaty. In contrast, sablefish in state waters are a state fishery and are covered under state LEPs rather than federal IFQs.

By 1990, the Canadian government realized that their economic return from the fishery were not as large as they could have been; their solution was to transform the halibut fishery from a competitive fishery to a cooperative fishery (Munro et al. 2009). Canada felt that effective economic resource management would be possible once the fleet was rationalized. They determined that inframarginal rents (returns to fishing effort) accrue to more efficient vessel operators in the fishery (Cook 1990). The implementation of the Canadian halibut individual vessel quota (IVQ) program in 1992 resulted in substantial ex-vessel price increases for Canadian fishermen (Casey et al. 1995; Herrmann 1996; Herrmann 2000). Canadians received a $2 price premium for deliveries outside of the short season fished off Alaska and because they delivered their catch to wholesalers and custom processors (Herrmann 2000). Although there were many arguments in favor of IFQs, it was primarily the increase in Canadian ex-vessel prices that won over fishermen. These developments changed some of the negative feelings about IFQs for the halibut fishermen off Alaska. However, fishermen who failed to meet the qualification criteria or had only caught small amounts of halibut and sablefish during the qualifying years adamantly opposed implementation of the program (Knapp 1996).

During this period, commercial halibut landings held steady at about 54 million pounds. Bycatch was reduced in response to changes in the BSAI and GOA groundfish FMPs and subsistence (personal use) fisheries expanded in 1992 (Figure 2.21).

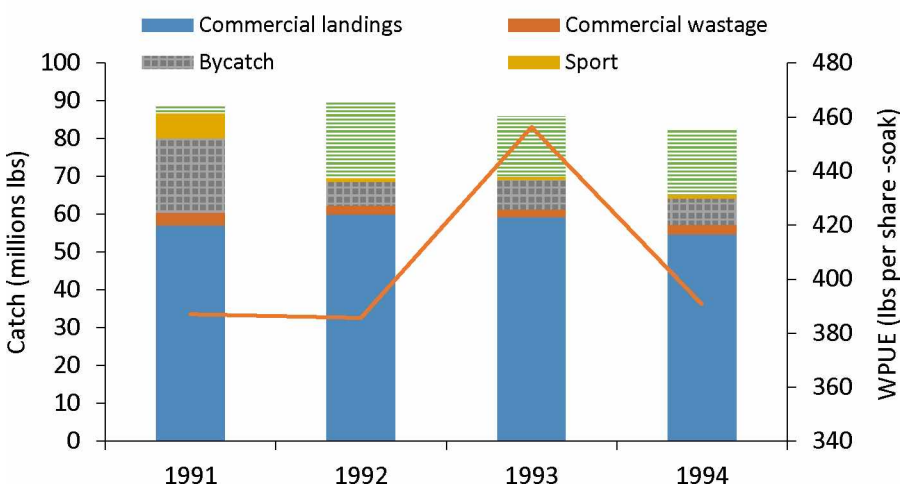

Figure 2.21. WPUE (pounds per skate-soak) and catches (million pounds) of halibut by sector, 1991 through 1994.

The IPHC setline survey WPUE for halibut, used to estimate the coastwide stock distribution among regulatory areas, held steady at nearly 400 pounds per skate-soak, substantially greater than in the preceding decades. During this period, commercial catches of halibut were primarily from the GOA (Area 3A; 40 percent) followed by the EBS (Area 4; 19 percent), and Southeast Alaska (Area 2C; 15 percent), with smaller catches from the U.S. Pacific Northwest (Area 2A; 13 percent), and British Columbia (Area 2B; 12 percent). As in the halibut fishery when large numbers of vessels entered the sablefish fishery managers controlled total catch by reducing season length. The last year-round opening for sablefish in the GOA was in 1983; by 1994, the fixed gear sablefish fleet totaled about 1,000 vessels and season length had collapsed to 10 days, warranting the label "derby" fishery (Hanselman et al. 2016). Catches in the sablefish fishery declined from 1991 through 1994, a 12 percent decrease in total catch (Figure 2.22). Sablefish biomass decreased 16.5 percent over this same period due to the pressure of other fishing vessels entering the fishery (Figure 2.22).

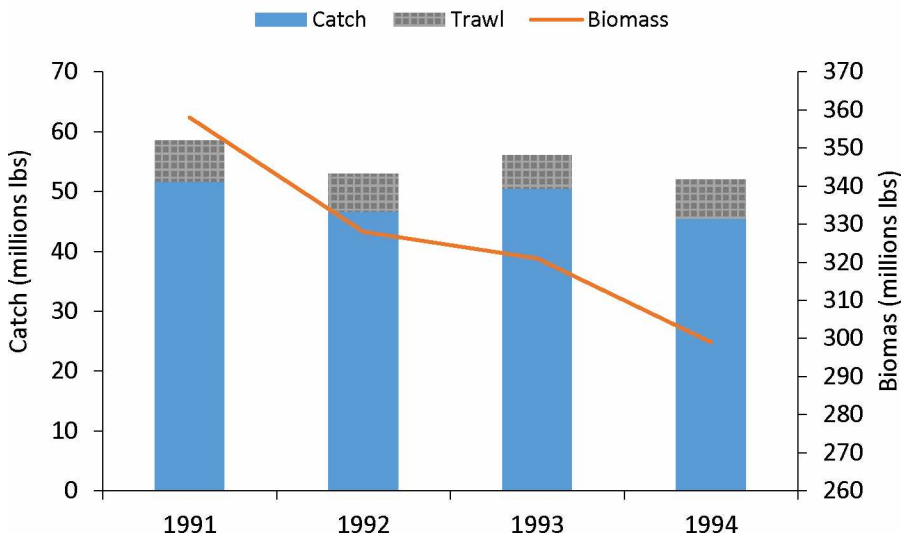

Figure 2.22. Catch and biomass (million pounds) of sablefish, 1991 through 1994.

From 1991, about 90 percent of the sablefish commercial catch has been taken with fixed gear; the remaining 10 percent has been taken with trawl gear (Figure 2.22).

2.7 1995 through 2017: Individual Fishing Quotas in the Alaska Region Halibut and Sablefish Fisheries

When IFQ-based management was proposed for the halibut and sablefish fisheries, there was considerable opposition from the fishermen (Pautzke and Oliver 1997). Between 1980 and 1990 the race-for-fish intensified in both fisheries, and after many public meetings and extensive analysis of alternatives, the NPFMC approved the Alaska halibut and sablefish IFQ program in late 1991 for initial implementation at the start of 1995. The program was intended to increase manageability of these fisheries and reduce overharvests while minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, and preserving the owner operator character of the fishery (Pautzke and Oliver 1997).

The outcome of program implementation depends on factors outside of management control as well as program design features. External forcing factors that affected the halibut and sablefish IFQ programs include external market forces, externally driven variations in stock abundance and distribution, unexpected interpretation of the regulations, unintended consequences—spillovers, as well as effects of program success and broader impacts.

Features of the Alaska Halibut and Sablefish IFQ Program

QS in these fisheries were assigned initially to vessel owners and leaseholders who made at least one landing in the years from 1988 through 1990 (NPFMC 1992b). The QS were defined as perpetual entitlements that can be freely transferred, subject to a few limitations, as gifts or voluntary market transactions. With few exceptions, only natural persons can hold halibut QS and those persons must be aboard the vessel while their QS are being fished. Rules on ownership and owner-on-board provisions are less restrictive for sablefish QS. Each season, the NMFS Alaska Regional Office assigns quota to QS holders by multiplying the percentage of quota share they own in each management area by the annual harvest limit set for the commercial fishery in that management area. Although halibut and sablefish are fished in a similar manner and most of the year in overlapping areas and at overlapping depths, they are completely different fisheries that are managed under one IFQ program. Halibut and sablefish have different markets and undergo different processing procedures. Before IFQs, halibut were sold into wholesale markets as a headed-and-gutted frozen product; following IFQ implementation halibut have been almost entirely marketed as a high quality fresh product supplied throughout most of the year (Matulich and Clark 2003; Hackett et al. 2005; Herrmann and Criddle 2006). In contrast, for the most part, sablefish continue to be marketed as a frozen product exported to Japan (Squires et al. 1988; Hastie 1989; Matulich and Clark 2003; Fell et al. 2011; Warpinski et al. 2016). Because of these differences, parts of this report are specific to halibut or sablefish with no analogy for the other species. The fisheries share similar management regimes but often have unique management challenges.

The Nature of QS and IFQ

Under MSA section 303A, limited access privileges such as QS and associated IFQ may be "revoked, limited, or modified at any time" without "right of compensation to the holder" and do not "create any right, title, or interest in or to any fish before the fish is harvested". That is, halibut and sablefish QS holders are granted a conditional usufruct, a privilege to participate in these fisheries under a system that allows management flexibility to respond to science-based population analysis and allows participants flexibility in when and where they fish (Gharrett 2012).

QS in the halibut and sablefish fisheries are assigned to specific management regions to reflect biological distribution of the stocks and to forestall localized depletion. For halibut, QS is stratified corresponding to the eight IPHC management areas (2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E) off Alaska (Figure 2.16). For sablefish, QS is stratified corresponding to the six NMFS management areas (Southeast Alaska, West Yakutat, Central GOA, Western GOA, EBS, and AI) off Alaska (Figure 2.17).

Two types of fishing vessels have participated in the halibut and sablefish fisheries: freezer longliners (CPs) and catcher vessels (CVs). CPs are generally large vessels that make lengthy trips and freeze their catch on the grounds, offloading on shore, or at sea to foreign trampers (sablefish). CVs, which may be from ten to over 100 feet in length overall, deliver their catch to shoreside plants or at-sea processors. Such deliveries are of chilled or iced fish. The halibut IFQ program designated one QS use category for CPs and three QS use categories for CVs based on the length overall of the vessel on which qualifying landings were made (Table 2.1). This was done primarily to maintain the profile of the fleet, particularly to protect owners of smaller vessels from domination by the more affluent owners of larger vessels. (Dawson 2005).

Table 2.1 Halibut IFQ program QS use categories

Class	Initial Specification*	Amended Specification*
A shares	Any CP	Any CP
B shares	CV > 60'	Any CV
C shares	35' < CV ≤ 60'	CV ≤ 60'
D shares	CV ≤ 35'	CV ≤ 35'

* Length categories are denoted as length overall in feet (').

The initial restrictions on vessel length were amended in 1996 to allow category B quota to be fished on smaller vessels. (See Appendix 2.1 for a listing of amendments to the Alaska Halibut and Sablefish IFQ Program.)

The sablefish IFQ program designated one category of CP QS and two categories of CV QS based on vessel size (Table 2.2).

Table 2.2 Halibut IFQ program QS use categories

Class	Initial Specification	Amended Specification
A shares	Any CP	Any CP
B shares	CV > 60'	Any CV
C shares	CV ≤ 60'	CV ≤ 60'

* Length categories are denoted as length overall in feet (').

After program implementation, QS holders petitioned the NPFMC to relax some restrictions on sizes of vessels eligible to fish IFQ of various CV categories. In January 1996, the NPFMC approved a "fish down" amendment that allows CV QS to be used on vessels of the same vessel size category or smaller. The NPFMC did this to increase accessibility of additional QS, and make the fishery more economical, for small boat owners and users. The amendment allowed the use of larger vessel category QS on smaller vessels, except in the Southeast area where "fish down" of category B (larger than 60 feet) QS is allowed only for QS blocks equivalent to less than 5,000 pounds (based upon 1996 quotas). This amendment became effective August 16, 1996 (50 CFR 679.40). A later amendment removed the Southeast fish down restriction to provide greater operational flexibility and harvest efficiency (72 FR 44795, August 9, 2007).

A change proposed to the NPFMC and subsequently implemented in 2007 allows IFQ derived from category D QS to be fished on category C vessels in Areas 3B and 4C, an action also known as "fish up". These areas are located in the western GOA and the AI; this measure was approved by the Secretary of Commerce to address increased concern regarding vessel safety for very small boat operations in remote Western Alaska areas, and to ensure that as much of the TAC could be harvested as possible (72 FR 44795, August 9, 2007).

To determine how many pounds of fish a QS holder may harvest during each year's fishing season (i.e., the person's annual IFQ), the NMFS Restricted Access Management (RAM) division, first establishes the QS pool (QSP) for each of the seven QS categories in each of the eight halibut regulatory areas and six sablefish regulatory areas. The QSP is the sum of all the QS units that have been issued in a given area for each species that may result in QS for the upcoming year. RAM calculates the QSP annually (on or about January 31). The QSP may vary slightly from year to year due to appeals, administrative adjustments, and civil penalties.

After fisheries managers determine the annual IFQ TAC, annual permit amounts for the *i*-th IFQ permit holder are calculated as the product of their QS holdings, the TAC, and the QSP:

$$IFQ_i = QS_i \div QSP \times TAC.$$

This equation yields the number of pounds of IFQ that the *i*-th QS holder may harvest during that year. Those IFQ allocations are adjusted upwards or downwards to account for overages or underages in that QS holder's

landings relative to their IFQ the previous year. Thus, the ratio of QS to IFQ varies by year and area. Annual variations in an individual's IFQ are driven primarily by their decisions to purchase or sell QS and by variations in the TAC. Landings are monitored and debited against their IFQ.

Eligibility for an initial distribution of QS

Eligibility for the *de gratis* initial allocation of QS is one of the more controversial parts of IFQ program implementation (NRC 1999a). Goals the NPFMC had for eligibility for the IFQ program were to credit both historic participation and current fishery dependence; and protect the capital investment made by vessel owners that participated before the IFQ program (Pautzke and Oliver 1997).

The program restricted initial issuance of halibut and sablefish QS to persons who, during 1988, 1989 or 1990 owned or leased vessels with the appropriate species' landings. Owners were required to be United States citizens and the vessel had to have been documented or registered as a vessel of the United States when qualifying landings were made. Initial QS amounts were based on the sum of each qualifying applicant's best five of six years landings for sablefish, or of seven years for halibut. This computation rewarded longevity and dependence on the fishery, while accommodating temporary disruptions in or absences from the fishery. In this manner, eligibility criteria attempt to maintain the pre-program structure and constituent dependence on the halibut and sablefish fisheries. Although there was some discussion (among policy makers) about including hired masters and crew in the initial allocation, skipper and crew shares were not included in the alternatives evaluated in the environmental assessment or regulatory impact reviews (NPFMC 1992).

Implementation and the Application Process

In preparation for the initial allocation of QS, RAM developed an official record of all halibut and sablefish landings, vessel owners, permit holders, and other relevant information, for the qualification (1988 through 1990) and QS determination (1984 through 1990) years. The official record was used to estimate how much QS would be issued to each eligible person.

Each person who appeared eligible under the official record was mailed a Request for Application (RFA), a pre-requisite to an application that allowed NMFS to unequivocally identify each potential applicant and collect some qualification information and current contact information. Persons who returned timely RFAs were sent an application packet and form with a copy of their official record. RFA and application forms also were available by request. Applicants could agree to the official record or make a contrary claim (Gharrett 2012). Despite clearly specified qualifying years, a long delay occurred between NPFMC action in 1991 and the publication of the final rule in late 1993. The program was further delayed for regulatory development, until the 1994 application period and start of fishing in 1995. This led to additional entrants who hoped that final implementation would modify the qualifying years. These "left outs" launched unsuccessful political and

legal campaigns to overturn the program, particularly the qualification criteria (Gharrett 2012). Applications were mailed to 8,000 potentially eligible fishermen. These resulted in issuance of QS to about 5,000 halibut fishermen and about 1,200 sablefish fishermen. About 1,800 applications were denied in all or in part. Of these, ten percent were appealed, leading to 11 court cases, eight for NMFS (Gharrett 2012). Applications for initial issuance of QS were received and processed by RAM. The application deadline was July 1994, and most applications were received in 1994. Issuance of QS to eligible applicants began in November of 1994.

Computation and issuance of QS

Information used to calculate the initial allocation was drawn from State of Alaska fish tickets, which record legal deliveries of fish to processors, and NMFS weekly production (processor) reports for fish processed at sea. Near the end of 1994, NMFS allocated the first halibut and sablefish QS. By 1995, most of the eligible applicants had received their allocations, although some allocations continued over time as appeals were resolved. Each successful applicant was issued a number of QS commensurate with the sum of their best five years of eligible landings history (pounds) with which they were credited. In general, a person who fished only one year would get 20 percent of their average landings, a person who fished two years would get 40 percent, and so on, up to a person who fished all of the qualifying years, who would get an average of the entire five (or six) years (NOAA 1994). Over 5,500 individuals received some quota share, but a large concentration went to a few hundred QS holders. (NOAA 2007)

The Appeals Process

Applicants challenging the official eligibility record were provided a single period in which to provide evidence to support claims. Denied claims could be appealed to the National Appeals Office (NAO, formerly Office of Administrative Appeals) which adjudicates all appeals. Most common for initial QS allocation were appeals for basic eligibility, vessel ownership/lease conflicts, and untimely applications. NAO decisions are subject to reconsideration requested by any party, and to the NMFS Alaska Regional Administrator's review. Administrative due process ends when the agency reaches "final agency action"; thereafter, an applicant may file in federal district court.

QS Transfers and Excessive Share Caps

QS transfers started shortly after NMFS made the initial QS allocations. Some of the QS transfers were to persons who were entering the fishery for the first time; other transfers were to persons who had received initial allocations and who were adjusting their QS holdings (NOAA 1994). To receive any QS by transfer, a person must have been an initial recipient of QS or have at least 150 days of experience as a crewmember of any United States fishery. The program includes additional restrictions on purchases of CV

QS by corporations, partnerships, or other business entities: only corporations, partnerships, or other business entities that were initial QS recipients may purchase more CV QS (See 50 CFR 679.41(g)). An exception to these rules occurs when an individual QS holder transfers his or her own initially-received QS to his or her own solely owned corporation (see 50 CFR 679.42 (j) and CFR 679.41 (g)(3)). Another entity that can acquire some types of QS is a non-profit community quota entity (CQE) approved by NMFS to purchase QS for the benefit of one or more of 46 eligible GOA communities (initially there were 42 with 4 additional communities added). IFQ owned by a CQE can only be leased to residents of the community in whose benefit the QS is held (CFR 679.41(d)).

Limits on Acquisition of Excessive Shares

In developing the halibut and sablefish IFQ program, the NPFMC introduced excessive use caps to ensure that halibut and sablefish QS ownership would not become concentrated. The halibut and sablefish IFQ program was intended to lead to some consolidation. However, the NPFMC was concerned that too much consolidation could result in loss of crew jobs, concentrate revenues in few coastal communities, and create enough market power for QS holders to undermine processing and support industries. The NPFMC expected that the consolidation would allow a smaller number of vessels to fish longer seasons and to enjoy improved safety, lessened competition on the fishing grounds, less fishing gear deployed, and less bycatch, discard, and waste; and as a result, enhance the profitability of the individual fishery operations (NPFMC 1991). Excessive share caps limit the amount of QS any person may hold, including QS held by a person directly, and QS attributed to that person through their ownership of a QS holding-entity such as a corporation or partnership. Excessive share caps were intended to constrain the extent and nature of QS consolidation. In the Alaska Halibut and Sablefish IFQ Program, excessive share caps include limits on the amount of QS that can be fished on a vessel or amount of QS a person could hold in a specific area, limits on the number of blocks of blocked-quota a person may hold, and limit the vessel size and operational categories on which QS may be fished. Initial QS recipients whose shares exceeded these restrictions were grandfathered in at their initial holding levels but precluded from accumulating more QS. Use caps are calculated by adding up all of the QS or IFQ held by a person and their percentage of direct or indirect ownership in any entity that holds QS or IFQ. This is called the "individual and collective" computations of caps. As an example, for an individual who holds 100 pounds of IFQ and has a five percent interest in a company that holds 100 pounds of IFQ, the amount of IFQ that person would be considered to hold for use cap calculation is 100 pounds (their personal holdings) plus five pounds (five percent of 100 pounds) from their ownership in that company (NOAA 2014). Initially, halibut QS caps were expressed in percentages of the annual QS pool for each management area, but in June 1996, the NPFMC approved an FMP amendment that increased the combined total holding caps for halibut in Areas 4A, 4B, 4C, 4D, and 4E from 0.5 percent to 1.5 percent. These percentages were applied to

the halibut QS pool in 1996 to establish a set number of QS units that would be used as a yearly cap. This allowed better planning and avoided a ratcheting up of QS holdings over time, and avoided cap overages in years in which QS pool sizes decreased from prior years.

Sablefish QS excessive share caps were set at one percent in each management area. Persons or entities that received more than one percent of the QS at initial allocation were grandfathered in but precluded from increasing their QS holdings in management areas where they already held one percent or more of the QS. NMFS monitors the accumulation limits for excessive shares during the transfer application review and approval process. QS holding entities must annually disclose ownership/membership to support cap computations. Table 2.3 shows the QSP sizes that in turn govern QS caps.

Table 2.3 Halibut QS use caps, 2017

Species	Area	Cap (%)	Size of Relevant (QSPs)	Cap (QSPs) c
Halibut a	2C	1%	59,979,977	599,799
	2C, 3A, 3B	0.5%	300,564,647	1,502,823
	4A, B, C, E	1.5%	33,002,937	495,044
Sablefish [b]	SE QSP	1%	68,848,467	688,485
	GOA and BS/AL Region	1%	322,972,132	3,229,721

a. Vessel IFQ caps are calculated on the IFQ TACs only; CDQ (Community Development Quota) TACs are not included in the calculation

b. Halibut weights are in net (headed and gutted) pounds, and sablefish weights are in round pounds.

c. Five halibut and 23 sablefish QS holders were grandfathered to hold more QS then the cap allowed.

The amount of annual IFQ in pounds that may be fished from any given vessel is limited to a small percentage of TAC, for any area or set of areas. This provision, together with the vessel category restrictions, was adopted to ensure that the number of vessels engaged in each fishing area would not fall below one hundred (Table 2.4).

Table 2.4 Vessel use caps, 2017 (pounds)

Species	Area	Cap (%)	Annual IFQ TAC (lb)	Vessel Use Cap (lb)[a]
Halibut	2C	1%	4,212,000	42,120
	All areas	0.5%	18,295,400	91,477
Sablefish	SE	1%	5,745,188	57,452
	All areas	1%	22,577,309	225,773

a. Vessel use cap pounds are net weight for halibut and round weight for sablefish

Table 2.4 shows that no vessel can be used to fish more than one percent of the halibut TAC for Area 2C; for 2017 that limit was 42,120 net pounds. Similarly, a vessel fishing sablefish IFQ in Southeast Alaska would be limited to no more than 57,452 round pounds.

Blocked QS

The Alaska Halibut and Sablefish IFQ Program includes a provision under which some QS was issued as indivisible blocks as another means of reducing entry barriers for new fishermen and smaller owner-operators in the fishery. Blocked QS may not be subdivided or consolidated upon transfer. In addition, the NPFMC placed limits on the number of blocks of QS that any one person may hold in any area. QS was "blocked" if, at initial issuance, the award yielded less than 20,000 IFQ pounds in 1994 equivalent pounds. The 20,000 pounds is actually a hypothetical IFQ based on 1994 TACs and the amount of the QS in the QS pool on October 17, 1994. The sablefish QS equivalent calculated for blocking limits varies in each area as TACs and the amount of QS in the QS pools changes.

Blocks cannot be broken up for transfer but must be sold or transferred to another person as an integral unit. Consolidation is constrained by limits on the number of blocks that can be held: a person can hold a maximum of two blocks in an area and a person with two blocks cannot hold any unblocked QS for the same area. The initial regulations allowed persons to combine, or "sweep-up," more than two blocks of halibut QS if their combined total weight was less than 3,000 pounds of IFQ. In April 1996, the NPFMC approved an amendment that increased the sweep-up limit for blocked halibut IFQ to 5,000 pounds. This regulation is now incorporated into 50 CFR 679.41(e). The 5,000 pounds of hypothetical halibut IFQ was based on 1996 TACs and the QS pool as of January 31, 1996. The regulation translates the rule into a specific amount of QS units for each management area effective December 31, 1996. In 2009, the limit on the number of blocks for the halibut changed from two to three blocks; sablefish block limits were not changed (50 CFR 679.42). When these blocking categories are combined with the vessel use and area categories, there are 96 management categories for halibut QS and 60 management categories for sablefish QS.

Transferability

The NPFMC included features in the halibut and sablefish IFQ program that were intended to preserve the owner-operator character of the fishery and to limit the extent of corporate participation and development of a rentier ownership. As noted above, only initial recipients and United States citizens with at least 150 days of crew experience aboard a United States commercial fishing vessel are eligible to acquire QS by transfer. Persons wishing to transfer QS must submit a notarized transfer application to NMFS. Applications received by the agency are reviewed to ensure that the recipient is eligible to receive QS and that the additional QS being transferred will not result in excessive shares. In addition to information that establishes the recipient's eligibility, transfer applications include the transfer price, financing, and brokerage fees. In addition, the transfer application asks about reasons for the transfer, relationship between parties, and how the QS/IFQ was located. That information provides the basis of reports on, for example, locational and demographic shifts in QS holdings. Quota shares can be sold with or without IFQ derived therefrom and with

adjustments from prior year QS use. However, while leasing—the temporary use of IFQ—is allowed for CP (A) shares, it is strictly limited for CV QS.

Leasing

To help ensure the owner-operator character of the halibut and sablefish fisheries, the NPFMC established the requirement that QS holders be aboard the vessel during harvest and offloading of IFQ species. While CP (category A) QS are fully leasable, with few exceptions, leasing of CV QS is prohibited. Leasing provides new entrants with the opportunity to participate in the fishery without need to purchase QS, which can be more than an order of magnitude more expensive than the corresponding IFQ. However, the absentee owners of QS could extract a substantial share of the net earnings of lessees (Pinkerton and Edwards 2009; Szymkowiak and Himes-Cornell 2015). In addition, if the IFQ lease is tied to lease of the QS holder's vessel, the QS holder may underinvest in safety equipment and vessel maintenance (Szymkowiak and Himes-Cornell 2015). During the first three program years (1995, 1996, and 1997), holders of CV QS could lease out up to 10 percent of their QS in each area. This was meant to provide operational flexibility, for example, for temporary medical needs, or to allow for mop-up of small amounts of IFQ remaining near the end of the season. However, these regulations expired on January 2, 1998. In 1995, the NPFMC also approved an amendment that authorized immediate transfer of QS to a surviving spouse with leasing privileges for a period of up to three years. This was intended to provide heirs with an opportunity to receive rental income from their inheritance as they consider disposition of their QS. The NPFMC is considering changes to this provision to define heirs as immediate family members of the deceased QS holder (NPFMC 2018). This proposed change is intended to clarify which individuals may receive QS and lease IFQ for three years after a QS holder death.

In addition, in most management areas, the IFQ program allows initial issuees and corporations that were initial recipients of IFQ to use hired masters to fish CV IFQ, but those hired masters must own at least 20 percent of the vessel used to fish the IFQ. The exceptions are strict prohibitions against the use of hired masters for halibut CV IFQ in Area 2C and sablefish CV IFQ in SE, where the initial issuees may only use hired masters for A shares (NOAA 2012). In addition to the lease provisions for initial recipients and heirs, the NPFMC has amended the halibut and sablefish IFQ program to allow CV QS holders to lease IFQ in case of emergency medical conditions or military call-up. Emergency medical transfers (72 FR 44795, August 9, 2007) allow CV QS holders to lease out their QS when they are unable to fish due to their own emergency medical needs of those of immediate family members who require their constant care. Use of emergency medical transfer provisions are limited to no more than two instances in five years for same medical

condition(s). Military transfer provisions (73 FR 28733, May 19, 2008) allow members of the military reserve or National Guard to lease out their QS when mobilized.

In addition, the NPFMC provided for leasing as a part of the Community Quota Entity (CQE; 69 FR 23681, April 30, 2004) program intended to address concerns about declining local engagement (fewer boats operating from their ports, fewer deliveries to local processors, declining QS ownership among community residents, and fewer community residents employed as crew) in the halibut and sablefish fisheries. CQEs are allowed to purchase QS for lease to community residents.

Cost Recovery Fees

No special taxes or fees existed to cover the cost of developing and administrating the IFQ programs before the IFQ program was implemented in 1995. In 1996, the MSA was revised to allow QS holders to be taxed at up to three percent of the ex-vessel value of their landings to offset the actual costs of management and enforcement of the IFQ program and, if requested by the NPFMC, to finance a loan program for QS purchases (MSA section 304(d)(2)(B)). The cost recovery program was implemented in 2000.

The cost recovery fees are used to cover all incremental management expenditures related to administration and enforcement of the IFQ fishery, including labor, travel, transportation, printing contracts/training, supplies as well as equipment, rent, and utilities. Actual expenses for a federal fiscal year are summed across NMFS offices, the IPHC, and ADF&G. Expenses are reimbursable only for costs that would not exist but for IFQ management. Details regarding expenditures and fee collections are available in NMFS reports to the fleet and online (NOAA2017f). In most cases, the fees that have been collected over the history of this program have been three percent or less. Agency expenses have remained low relative to fishery value, ranging from one to three percent of the annual ex-vessel value of the IFQ halibut or sablefish (NOAA 2012). This program demonstrates that implementation and ongoing management and enforcement can relieve taxpayers of the burden of managing catch share programs. The cost recovery fee is based on "standard" ex-vessel prices, which are calculated by NOAA fisheries from shoreside processor registered buyer's annual value and volume reports; holders of CV IFQ may challenge the standard prices applied to their landings, but the burden of proof of value received lies with permit holders.

Loan Program

Under the MSA, cost recovery funds can be used to support loans to assist entry level and small-vessel fishermen, and refinance QS. NMFS Financial Services Division administers these loans, which are long term, low interest loans that may finance up to 80 percent of quota value.

Monitoring, Data Collection, and Enforcement

Enforcement is one of the most important conditions for a successful fishery and typically works best for fisheries that occur in areas that are well defined and remote (Squires et al.1995). Most IFQ programs incorporate substantial enforcement effort such as physical dockside checks during offloadings, at-sea boardings and inspections, and may include human observers or cameras onboard fishing vessels (Soliman 2014a). Monitoring for the halibut and sablefish IFQ fisheries includes real-time and post-transaction auditing of all landings. Buyers of IFQ halibut or sablefish must be registered with NMFS and must have a current annual license. All landings if IFQ halibut and sablefish are recorded using an electronic reporting tool, to provide real-time accounting and accountability. The electronic reporting system started as a simple electronic card-swipe data collection system but has evolved into a detailed real-time internet-based electronic reporting system, built and supported by NOAA Fisheries, the IPHC, and the ADF&G. Overall compliance in the halibut and sablefish fisheries is considered to be good due, in part, to close cooperation with the United States Coast Guard (USCG), the NMFS Office of Law Enforcement (OLE), and the Alaska State Troopers and Alaska Fish and Wildlife (Marvelle 2018).

Prior Notice of Landing and Landing Restrictions

Halibut and sablefish IFQ landings are not restricted to specific United States ports, but only three Canadian ports are authorized to receive landings from vessels operating in the halibut and sablefish IFQ program. Vessel operators making landings outside of Alaska must complete additional reports that enable enforcement to track landings and fishery offloads. QS holders or their hired masters must "hail in" at least three hours in advance of the landing IFQ halibut or sablefish and landings must commence no later than 18 hours after they hail in. This "prior notice of landing" requirement provides time for NMFS, the USCG, IPHC, and ADF&G personnel to deploy to sample logbook and biological data for selected landings. Offloads may commence only between 6:00 am and 6:00 pm. Catches are electronically logged against the QS holders IFQ based on landings reports submitted by registered buyers that receive their landings. To help preclude under-reporting, all IFQ fish must be offloaded from the harvesting vessel at the time any IFQ fish is offloaded; all fish must be weighed and reported. Thereafter, fish may be reloaded back onto the harvesting vessel for delivery elsewhere or for use as "take home fish" or as crew payment.

Overage and Underage Provisions

For fishermen, precisely matching actual catch with available IFQ is challenging because large numbers of fish are caught each time they deploy their gear and the weight of those fish vary. Thus, in most years, fishermen land slightly less or slightly more than their available IFQ, which is characteristic of most fisheries managed under IFQ or other types of catch shares. There are three basic approaches to addressing

the tendency towards moderate mismatch between actual landings and available IFQ. New Zealand and some other jurisdictions rely on a system of Pigouvian taxes (deemed values) under which the entire value of excess harvests is taxed away (Annala 1996; Dewees 1998; Holland and Herrera 2006; Townsend 2010). A second approach, popular in multispecies ITQ fisheries is the development of spot markets for electronic trades to lease small amounts of IFQ needed to cover overages (Squires et al. 1998, Branch and Hilborn 2008, Toft et al. 2011). The third approach, which is applied in the halibut and sablefish IFQ fishery, is to allow small overages and underages to be carried over between years. Here as in many other fisheries, civil penalties are assessed for excessive overages (62 FR 26246 May 13 1997). The line between administrative adjustments and civil penalties is 10 percent of account pounds remaining at the start of the trip in which an overage occurs. In many (but not all) cases, overages and underages are carried into the next year where they result in adjustments to IFQ account allocations. To prevent large allocation shifts between years, carryover adjustments from underages are limited to a small percentage of each person's start year IFQ account (limited to 10% of last trip). Adjustments for overages are fully deducted from the following year IFQ. Adjustments: "follow the QS" by affecting the year-end remaining balance of the IFQ user and apply to the next year's starting account of the person who, at that time, is holding the QS for which resulting IFQ was under- or over-fished the prior year.

Limited administrative adjustments were advocated by industry as well as the IPHC and NMFS management and enforcement, to allow for imprecision in at-sea harvest estimation without causing large shifts of TAC among years; to help achieve optimum yield while minimizing mortality from undesired practices that guarantee fishermen would harvest their full annual allocations, such as discard of overages; provide some business flexibility in use of annual IFQ over more than one year; and to help avoid violations. This process, combined with the flexibility to accomplish QS transfers with or without the full complement of annual IFQ from those QS, created a highly complex transfer and account management system but has achieved its management goals and proven highly popular with constituents and beneficial to the resource as well as managers, law enforcement, and stakeholders. Concerns about how carryover provisions as relate to annual catch limits (ACLs) established under the MSA are under discussion within NMFS.

Persons fishing IFQ allocations must retain sablefish and legal-sized halibut caught during a trip to the extent that anyone on board the vessel has access to unused IFQ allocation of the appropriate type. Common IFQ violations have included fishing in closed areas, fishing without the IFQ permit holder onboard, logbook discrepancy or violations, overages, fishing without IFQ permits, retention of undersized fish, and making landings without prior notice or at an undesignated port (NOAA 2012). NOAA IFQ enforcement activities include a partnership between the NMFS Enforcement officers and the Alaska State Department of Public Safety through a joint enforcement agreement. The United States CG also plays an enforcement role at sea.

Monitoring, auditing, and enforcement of catch share programs is labor intensive and the available resources are often overestimated. For catch share programs, accountability and enforceability from harvester through wholesaler enables interception of unlawful product. Real-time debiting of catches against annual catch entitlements reduces the frequency of overages and ensures that overages are detected when they occur. Deemed value systems, spot markets, or provisions for deducting overages from future annual catch entitlements help fishermen deal with occasional unintentional overages and allow enforcement to focus on egregious violations (Sanchirico et al. 2006). Enforcement is included in the cost recovery and is one of the largest expenses for the fishery.

Vessel Monitoring System (VMS)

Vessels participating in the halibut and sablefish fisheries are not required to operate vessel monitoring system (VMS) satellite transceivers except in the AI region where VMS is required for all groundfish vessels. In the Eastern Bering Sea (IPHC Area 4), vessels can use VMS in lieu of the IFQ vessel clearance requirement (an alternative to a scheduled port visit prior to commencement of fishing). In 2011, 268 commercial fishing vessels used a VMS satellite transceiver in Alaska. The near real-time tracking capabilities of the VMS assist in ensuring compliance in the IFQ halibut and sablefish fisheries. Among other things, the use of VMS on vessels allows IFQ fishermen to fish multiple regulatory areas on a single trip. VMS greatly facilitates enforcement of open and closed areas in Area 4.

Observer Coverage

In 2010, the NPFMC imposed a 1.25 percent tax on ex-vessel revenues to support the observer program. This set the stage for expanding observer coverage to smaller vessels and fisheries that had been partially covered. Contract employees of the North Pacific Fishery Observer Program do not play an enforcement role; rather, they take biological samples of the catch, track bycatch, and collect other data for fishery managers and scientists. The observer can report violations which leads to enforcement action but this is not their primary role. Beginning in 2016, the program was expanded to include deployment of observers in the halibut longline fleet and on sablefish fishing boats that are less than 60 feet. Sablefish vessels over 125 feet will be required to have 100 percent observer coverage, those between 60 feet and 125 feet will be required to have 30 percent coverage. Under authority of the revised Observer Program, NOAA Fisheries will have greater control over when and where observers are deployed; fishermen will incur the costs of this expensive monitoring system and their flexibility in trip planning will be circumscribed. The revised program will expand observer coverage into currently unobserved components of the fisheries (NOAA 2017).

Electronic monitoring in 2018

NOAA (2017c) describes a new electronic monitoring (EM) program for the small-boat fixed gear (pot and longline) fleet as an alternative to onboard observers. The EM program uses video cameras to monitor catches and discards. EM has been motivated as less costly than an onboard observer program and as an option for smaller CVs that are unable to accommodate an onboard observer (NOAA 2017d).

Electronic IFQ Landing Reports

Since the start of the IFQ program, registered buyers have been required to report IFQ landings using electronic reporting (ER) tools to provide real-time accounting. Electronic reports must be submitted within specific interval following the offload and before the vessel leaves the landing location (Gharrett 2012). The first ER system involved magnetically encoded cards and reporting of IFQ species only. After about 6 years, an internet-based system with full-screen editing was introduced and remains in use for just a few small operations today. That system has been largely replaced by the Interagency Electronic Reporting System (IERS also known as eLandings) (and its components, tLandings and seaLandings) was developed to report commercial fishing landings in Alaska and/or production data for groundfish. This system was developed as a collaborative effort of the ADF&G, the IPHC, and NOAA Fisheries. The system currently is the main system for reporting IFQ and Western Alaska Community Development Quota (CDQ) halibut and sablefish. The electronic landings reports are submitted by shore-based registered buyers and mothership processors; most CPs are registered buyers and submit electronic landings reports for fish processed at sea. When the product is ready for shipment, registered buyers must complete a Product Transfer Report. A Departure Report is required for vessels crossing the seaward EEZ boundary or entering Canadian waters. Transshipment reports document transshipment of processed product transferred at sea. To support computation of standard ex-vessel prices used in the cost recovery program, registered buyers operating as shoreside processors must submit annual Value/Volume Fee Reports of pounds of IFQ fish purchased and value paid to harvesters for those fish, by species, month, and port (or port group).

Registered Buyers

All IFQ registered buyers must report landings of IFQ halibut and sablefish. They must obtain a permit for each CP, mothership, stationary floating processor, and land-based facility at which IFQ fish or CDQ halibut will be received. Many registered buyers hold more than one permit. RAM issued 169 permits in 2017. Sixty-seven percent of permit holders reported landings in 2017 compared with 72 percent in 2016.

Halibut and sablefish fisheries, 1995 through 2017

From 1995 through 2017, the Alaska halibut commercial landing overall average was 53.15 million pounds. However, landings peaked at nearly 75 million pounds in 2002 before collapsing to less than 24 million pounds in 2014 (Figure 2.23). Over this same period, commercial wastage averaged 1.9 million pounds, bycatch averaged 8.6 million pounds, subsistence and personal use averaged 11.4 million pounds, and sport fishing averaged 1.1 million pounds. WPUE peaked at 307 pounds per skate-soak in 1997, five years ahead of the peak in commercial landings and dropped to 156 pounds per skate-soak in 2013 (Figure 2.23). During this period, commercial catches of halibut were primarily from area 3A (36 percent) and Area 4 (19.4 percent); areas 3B and 2B each accounted for about 15 percent of the total; the balance of catch (13 percent) came from area 2C.

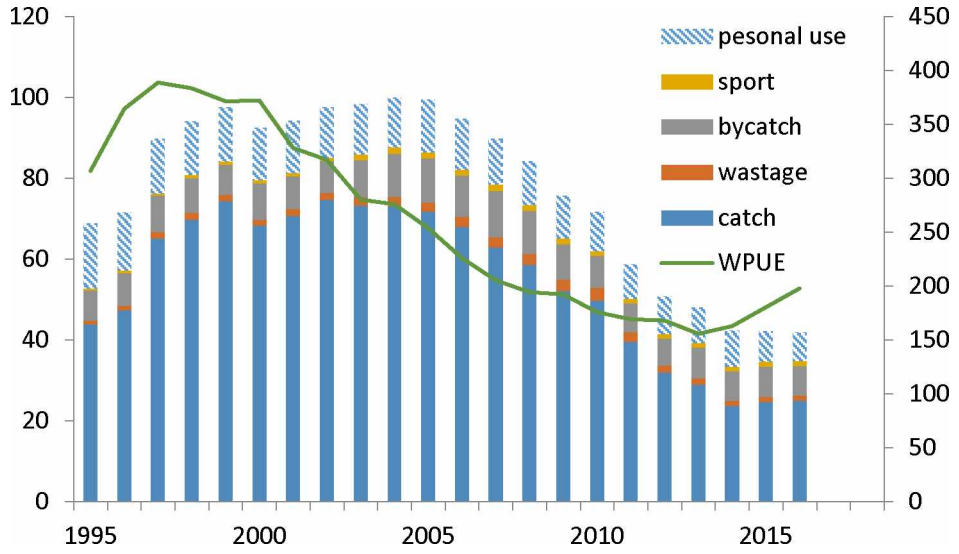

Figure 2.23. WPUE (pounds per skate-soak) and catches (million pounds) of halibut by category, 1995-2017.

Sablefish catch dropped from over 45 million pounds in 1995 to less than 20 million pounds in 2016 and 2017 (Figure 2.24). Over this same period, biomass fluctuated between 307 million pounds and 232 million pounds (Figure 2.24). Catches have declined more rapidly than biomass because the harvest control rule applied to sablefish sets TAC more conservatively when biomass declines, reducing the amount of fish available for harvest.

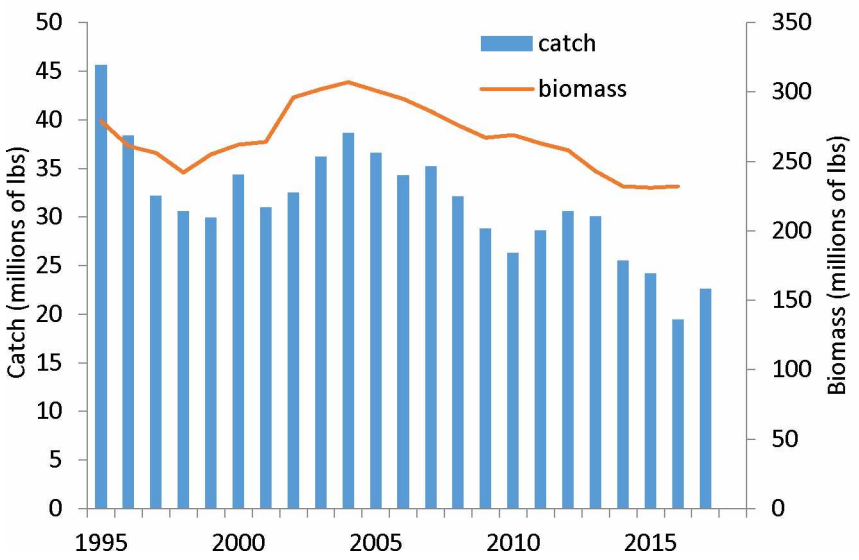

Figure 2.24. Biomass and catch (million pounds) of sablefish, 1995-2017.

An emerging problem over recent decades for the sablefish fishery is depredation of hooked sablefish by sperm whales and killer whales s. Killer whale depredation of sablefish was first recorded by observers in 1995; depredation by sperm whales was first noted in 2001 (Peterson et al. 2014; Straley et al. 2015; Peterson and Hanselman 2017).

Biological variability in the abundance and size of halibut

Development and improvement of halibut stock assessment models is a primary focus of IPHC research. The models underpin the design of harvest control rules used to set annual catch limits across management areas. The harvest control rules are designed to react conservatively to changes in coastwide biomass and variations in the biogeographic distribution of the stock and are intended to provide mangers with the means of influencing the trajectory of biomass through time. Recent declines in halibut WPUE (Figure 2.23) reflect trends in halibut biomass (Figure 2.24) and trends in halibut size at age (Figure 2.25 and Figure 2.26). Changes in halibut growth at individual and population scales have led to reductions in the halibut IFQ TAC, and to particularly precipitous decreases in the Area 2C TAC. Recent increases in WPUE (Figure 2.23) and biomass (Figure 2.24) have led to a three percent increase in the 2016 TAC relative to 2015 TAC and a five percent increase in the 2017 TAC relative to 2016 TAC (IPHC 2016).

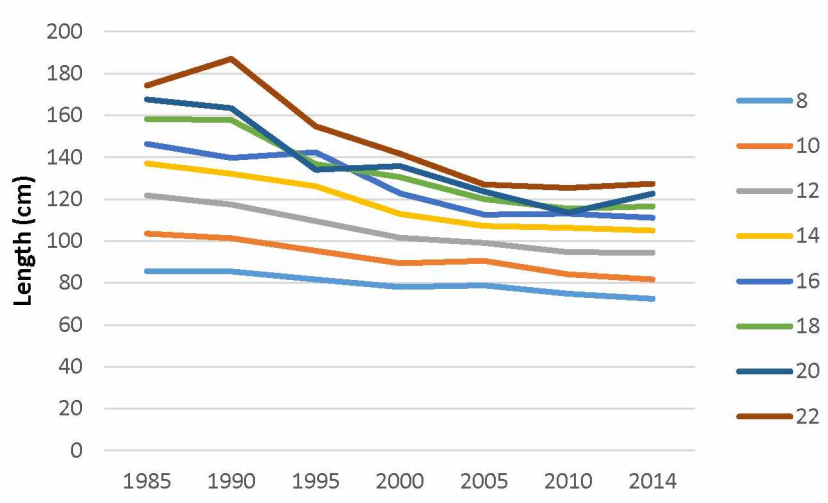

Figure 2.25. Average length-at-age (cm) for female halibut, 1985 through 2014 (Martell et al 2015).

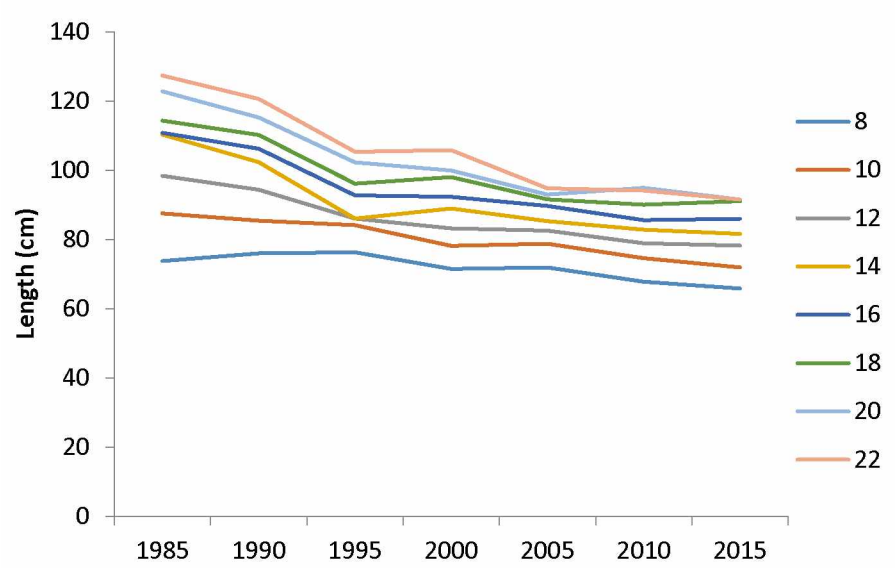

Figure 2.26. Average length-at-age (cm) for male halibut, 1985 through 2014 (Martell et al 2015).

Time series observations based on data from the annual IPHC stock assessment surveys indicate substantial changes in halibut growth rates. There was an increase in halibut growth rates in the middle of this century, especially in Alaska. Over the past two decades, halibut growth rates have declined to levels not seen since the 1920s. The reasons for variation in halibut growth rates are not yet known but may be tied to fluctuations in abundance of other species, such as arrowtooth flounder, and the availability of food supply (Clark 1999; Criddle and Herrmann 2008; Sullivan 2017). Female and male halibut grow rapidly until the onset of sexual maturity, about age 10. Long-term average growth rates are about two inches per year for males and two-and-a-half inches per year for females. Thereafter, females tend to grow even faster, while male growth generally

slows down relative to that of females. Over the last decade, growth rates for these larger fish have been about one inch or less than one inch per year, meaning that in recent years, adult halibut are much smaller at any given age. Figure 2.25 shows that in 1985, average-sized female halibut at age 20 were 168 cm (66 inches) while in 2014, average-sized female halibut at the same age were only 123 cm (48 inches). Between 1985 and 2015, average-sized 20-year-old male halibut declined from 123 cm (48 inches) to 91 cm (36 inches); see Figure 2.26. This has contributed to the decline in biomass (Figure 2.24) and reductions in the IFQ TAC. Because weight increases as a nonlinear (nearly quadratic) function of changes in length, weight-at-age has decreased even faster than length-at-age. Because catch limits are expressed in biomass, reductions in halibut growth rates lead to increases in the numbers of fish that need to be caught to reach the TAC. In addition, when combined with a 32-inch minimum size limit for commercial halibut, declines in halibut size-at-age increase regulatory discards and total discard mortality.

Community program

Western Alaska Community Development Quota Program, 1992 through 2017

The CDQ program was established to provide fishermen who resided in western Alaska with an opportunity to participate in the BSAI fisheries that had been foreclosed to them because of the high capital investment needed to enter the fishery (Ginter 1995, NRC 1999b, Strong and Criddle 2013). The 65 small villages eligible to participate in the CDQ Program are located within 50 nautical miles of the Bering Sea coast or on an island in the Bering Sea (Figure 2.27). Approximately 27,000, predominantly Alaska Natives, live in these communities. The communities have organized themselves as six 501(c)(3) non-profit corporations that manage and administer CDQ allocations, investments, and economic development projects. One CDQ group represents a single community (St. Paul, Pribilof Islands) and the remaining CDQ groups represent between six and 20 communities. Since implementation of the CDQ program, royalties from leasing quota to commercial partners and earnings based on those royalties have become one of the largest sources of non-governmental revenues in the CDQ communities (Northern Economics 2001, 2002; Criddle and Strong 2013).

Figure 2.27. Western Alaska CDQ communities and groups. (Source: NMFS)

When originally implemented in 1992 as part of the inshore /offshore allocation of pollock in the BSAI and as reauthorized in 1995 and 1997, the CDQ allocations only applied to pollock and the CDQ program was subject to a three-year review/sunset cycle (FR 1992, FR 1995, FR 1997, NRC 1999b). In 1998, the American Fisheries Act (AFA 1998) eliminated the sunset provision and increased the CDQ pollock allocation to ten percent of the BSAI TAC. The CDQ program was expanded to include allocations of ten percent or more of the annual total allowable catch for other BSAI groundfish species, sablefish, halibut, king and Tanner crab, as well as prohibited species catch limits under the 2006 MSFCMA reauthorization (NMFS 2007) as amended by the Coast Guard and Maritime Transportation Act of 2006. Setting aside TAC for CDQ reduces the amount of TAC available to other harvesters. In the case of halibut, CDQ allocations were awarded in the form of QS in IPHC Areas 4B, 4C, 4D, and 4E. Individuals who held QS in those areas before QS was awarded to the CDQ entities were offered compensation in the form of QS in Areas 2C, 3A, 3B, or 4A (50 CFR 679.41(j).) The compensation scheme increased the QSP in Areas 2C, 3A, 3B, and 4A, thereby reducing all future IFQ awards to QS holders in those regions. Allocation of sablefish QS to CDQs used similar mechanisms.

Changes to and Outcomes of the Alaska Halibut and Sablefish IFQ Program

Implementation of the IFQ program fundamentally reshaped the halibut and sablefish fisheries. Understanding program outcomes entails disentangling the effects of program features from the influence of other biological, economic, and social drivers. Moreover, it entails accounting for the influence of a nearly continuous stream of amendments to the program, amendments that began to be proposed even before the IFQ program was fully implemented. To address these proposals, the NPFMC established an annual review cycle and an industry workgroup to recommend which proposals to analyze (Pautzke and Oliver 1997).

Season length

In designing the halibut IFQ program, the NPFMC was anxious to replace the short derby season with an extended season. The NPFMC thought that an extended halibut season would increase the availability of fresh product and would lead to quality improvements, which would lead to higher ex-vessel prices. In addition, it was expected that a slower-paced fishery would be less likely to exceed the TAC and would have a positive effect on safety at sea (Hughes and Woodley 2007). Because of differences between markets for halibut and markets for sablefish, it was not expected that extended seasons would lead to increased market opportunity for sablefish, but it was anticipated that a slower paced sablefish fishery would lead to increased management precision and safety at sea. Figure 2.28 shows season length in the halibut fishery (1974-2017) and the sablefish fishery (1985-2017). In the 20 years leading to IFQ implementation, the halibut season length collapsed from 125 days to as little as two days in IPHC areas 2C and 3A. Similarly, in the ten years leading up to IFQ implementation in the sablefish fishery, season length fell from 240 days to ten days. Since IFQ implementation, season lengths have averaged 145 days in the halibut and sablefish fisheries, with landings distributed widely across the season (Figure 2.28). Thus, the program met the objective of extending fishing seasons for halibut and sablefish and reducing congestion on the fishing grounds. In their model of domestic and international trade flows, Herrmann and Criddle (2006) conclude that the transition from a short derby to an extended season resulted in statistically significant increases in U.S. wholesale and ex-vessel prices for halibut and concomitant statistically significant decreases in ex-vessel and export prices for Canadian halibut.

Figure 2.28. Season length (days) in the halibut (1974 through 2017) and sablefish (1985 through 2017) fisheries.

Economic Outcomes

Economic outcomes of IFQ program implementation include substantial increases in ex-vessel and wholesale prices for halibut (Matulich and Clark 2003; Herrmann and Criddle 2006) and sablefish (Fell and Haynie 2011; Warpinski et al. 2016) with a redistribution of economic rent in favor of fishermen (Matulich and Clark 2003; Hackett et al 2005; Herrmann and Criddle 2006). Because the program created QS that was perpetual and transferable and because QS was allocated *de gratis*, initial recipients received windfall gains that reflected the expected net present value of all future harvests associated with their allocation of QS (Newell et al. 2007). That is, the allocation of QS was an allocation of wealth equivalent to the opportunity cost of the derby. While the windfall gain to initial recipients greatly increased their wealth, those who acquire QS through market transactions will, on average, pay the expected net present value of all future harvests associated with any QS they purchase. The need to purchase QS increases the cost of entry. However, that cost can be recouped when the QS are later sold. A focus on the purchase price of QS has led some policymakers to express concerns that individuals with poor credit history and inadequate collateral may have difficulty qualifying for loans needed to finance the QS and other capital needed to engage in the halibut or sablefish fisheries.

Fishing forms the economic base of many Alaskan communities. Consequently, changes in where vessels homeport, where they land their catches, and where fishermen and crew reside have regional economic impacts (Seung 2015, 2016; Seung and Waters 2006). Relaxation of time constraints associated with the race-for-fish reduce the economic advantage of small remote ports and increase the advantage of larger ports that have multiple processors and competitive transportation infrastructure. Shifts in the geographic distribution of

landings and residence of QS holders since implementation of the halibut and sablefish IFQ programs are described in NOAA (2007, 2010, and 2015) and Himes-Cornell and Hoelting (2015). Loss of landings reduces the viability of processing operations and vessel support services, and reduces landings tax payments that support local government. Outmigration of QS holders often leads to reductions in local spending and local employment, which lead to shrinkage of the local economy. Conversely, communities that experience increased landings and in-migration of QS holders experience economic growth. These economic outcomes engender social impacts (Carothers et al. 2010).

Safety at Sea

The number of fatalities in the Alaskan halibut and sablefish fleets has decreased significantly following IFQ implementation (Figure 2.29). Knapp (1999) reported on a survey of halibut QS holders. They indicated that implementation of the IFQ program led to improved safety in the fleet (Knapp 1999). Formal evaluation of vessel losses (Hughes and Woodley 2007) and fatalities (Lincoln et al. 2007) in these fisheries concluded that there were statistically significant reductions in the six years following IFQ implementation. However, fluctuations in the number and rate of fatalities from 1991 through 2015 highlight ongoing risks in these fisheries. Between 2001 and 2015, 15 commercial fishing fatalities were reported in the halibut/sablefish fisheries. Drowning was the leading cause of death following vessel disasters; severe weather contributed to all four of the fatal vessel disasters. Falling overboard contributed to four deaths during 2001-2015; all involved individuals were not wearing personal flotation devices (Lucas et al. 2013).

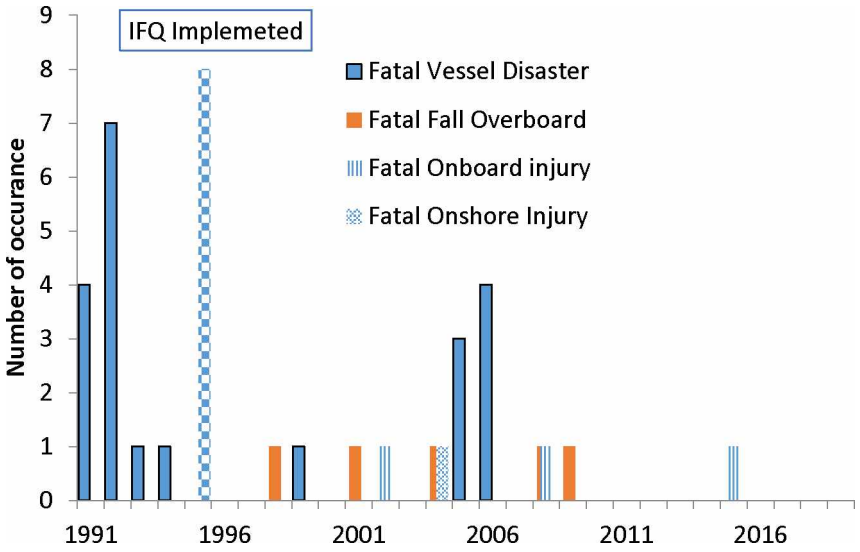

Figure 2.29. Fatalities at sea in the halibut and sablefish fisheries off Alaska, 1985 through 2016. (Hughes and Woodley 2007)

Social Outcomes

Concerns about long-term social changes attributable to implementation of the IFQ program have been voiced by fishery stakeholders. Specifically, stakeholders are concerned about: (1) financial barriers to entry; (2) the growth of *de facto* (and *de jure*) leasing and consequent dilution of owner-on-board requirements; (3) reduction in the number of crew positions; (4) changes in crew compensation, due to rental payments to QS holders; and (5) reductions in the amount of QS held by residents of some small rural communities. This latter issue is a particularly prominent component of discourse in small coastal communities in the Central GOA that depend on commercial fishing for their economic base (e.g., Carothers 2008, 2010; Carothers et al. 2010). The transfer of QS to persons outside a local area or a radical change in harvest and delivery patterns under the program might have harmful effects on some communities. Himes-Cornell and Kasperski (2016) show that the well-being and resilience for fishery-dependent communities in Alaska depends on the state of the available fish resources as well as the extent to which community residents are vested in the fishery through ownership of limited entry permits and QS.

Biological and Ecological Outcomes

Theoretical explorations of IFQ systems (e.g., Moloney and Pearse 1979; Pearse 1980; Wilen 1985; Scott 1988) anticipated that program implementation would effectively address the common pool dilemma (Schlager and Ostrom 1992), that QS-holders would recognize an individual interest in ensuring that the stock would be managed to maximize economic yield. However, Johnson and Libecap (1982), Boyce (1992), and NRC (1999a) countered that an entitlement to harvest a predetermined quantity of fish did not address externalities that arise from common ownership of the stock of fish with resulting stock externalities that could lead QS-holders to underinvest in actions needed to ensure stock productivity. Recent empirical analyses by, e.g., Costello et al. (2008) and Melnychuk et al. (2016), establish that sustainable fisheries are managed under governance and management systems that set conservative overall quotas and allot catch shares among fishermen. That is, they see little direct evidence of the stock externalities anticipated by Johnson and Libecap (1982) and Boyce (1992).

The halibut and sablefish IFQ fisheries satisfy the criteria set out in Melnychuk et al. (2016), with conservative overall TACs set based on well-established stock assessment models backed by regular fishery independent surveys, catch accounting measures are strong, and enforcement is effective. One of the principal biological and ecological outcomes of the halibut and sablefish IFQ programs is the elimination of overages (Figures 2.30 and 2.31). In years leading up to the implementation of IFQs, the halibut fishery overharvested the TAC in some areas up to 7.6 percent. Since implementation, the halibut fishery has averaged an under harvest of 6 percent (Figure 2.30).

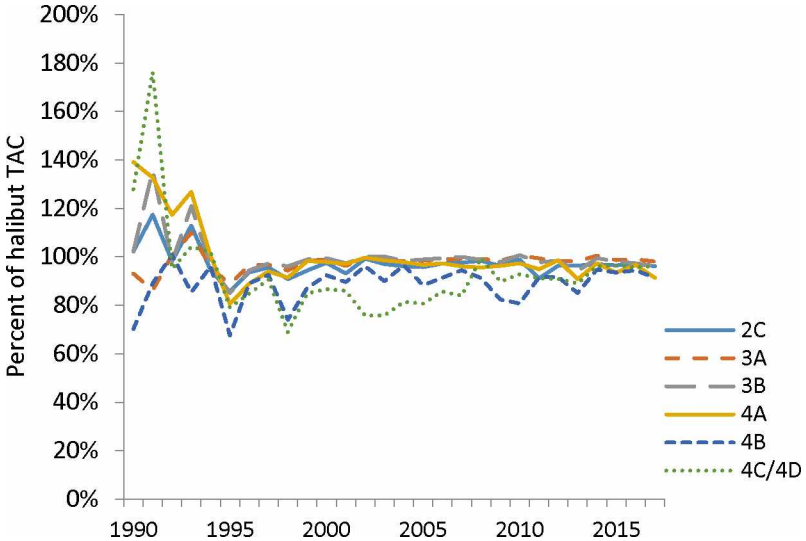

Figure 2.30. Percent overharvest or underharvest of halibut commercial TAC, 1990 through 2017.

In years leading up to the implementation of the IFQ program, the sablefish fishery overharvested the TAC in some areas by 27 percent. Since implementation, the sablefish fishery has averaged an underharvest of 17 percent (Figure 2.31).

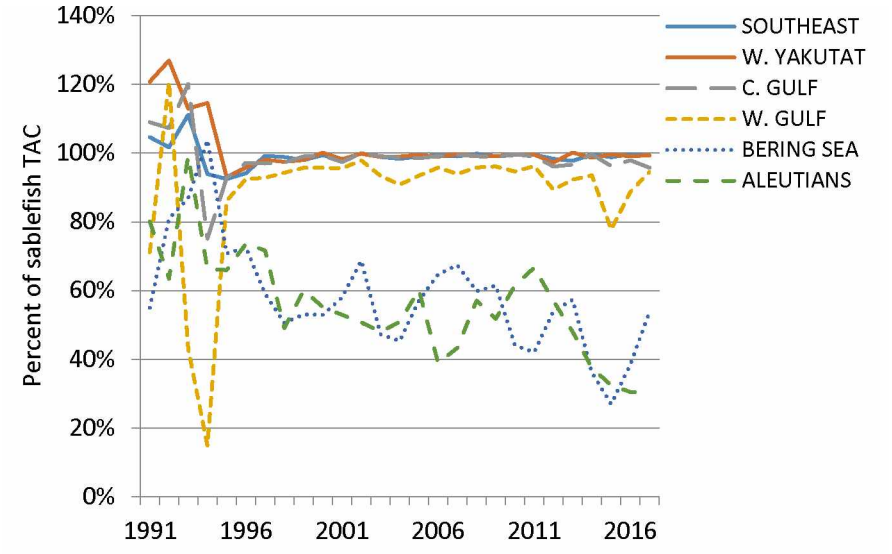

Figure 2.31. Percent overharvest or underharvest of sablefish TAC, 1991 through 2017.

Despite the abundant resources dedicated to assessment and management of halibut and sablefish stocks, as noted above (Figure 2.2 and Figure 2.6), biomass is near historic lows for both halibut and sablefish and halibut size at age is also nearing all-time lows. In addition, in looking at historical surveys along with

evidence in spawning from high-resolution tag data, Loher (2011) finds evidence to suggest that the fisheries closures are not long-enough to protect spawning halibut.

Whale Depredation

Killer whale depredation of hooked fish is most common in the BSAI, and Western GOA areas; it is rare in the Central GOA, and not yet observed in the West Yakutat and East Yakutat regions. Sperm whale depredation has been recorded by observers in the Central GOA, West Yakutat, and East Yakutat areas, but only infrequently in the Western GOA and has not yet been recorded in the BSAI (Peterson et al. 2014; Hanselman et al. 2016). In response to depredation of sablefish on longline gear, pot gear use has expanded in the BS and AI regions and is now permitted in portions of the GOA (81 FR 95435 2017). The use of pots for fishing sablefish is only possible on larger vessels, so there is concern that the smaller vessels (mainly in Southeast Alaska) will be disadvantaged by this ecologically driven shift to pot gear.

Dead loss, Bycatch, and Wastage

Dead loss (ghost-fishing) is the unintended fish mortality that occurs when fishing gear is lost or abandoned after having been deployed. Bycatch, also called incidental catch, is the unintended and incidental catch of halibut (sablefish) that occurs during fishing for other species. Wastage is the mortality of undersize (<32 inch) halibut discarded in the halibut directed fishery. Bycatch of sablefish can be similarly categorized. These artifacts of fishing have biological, ecological, economic, and social consequences.

Dead loss was first estimated by IPHC in 1985 with the highest level occurring 10 years before the IFQ program was implemented, an estimated average annual loss of 1.82 million pounds, with annual losses ranging from 3.2 million pounds in 1986 to 770 thousand pounds in 1993 (Figure 2.32). Commencement of the IFQ program in 1995 ended the race-for-fish, allowed the fleet more time to recover gear and to shift gear setting and hauling gear to times with expected favorable weather conditions (NOAA 2016a). Since implementation of the IFQ program, average annual dead loss has dropped to 180 thousand pounds (Figure 2.32). Sigler and Lunsford (2001) estimate that after implementation of IFQs, ghost-fishing losses in the sablefish fishery declined from an average of 3.2 percent of the TAC to less than 0.5 percent of the TAC.

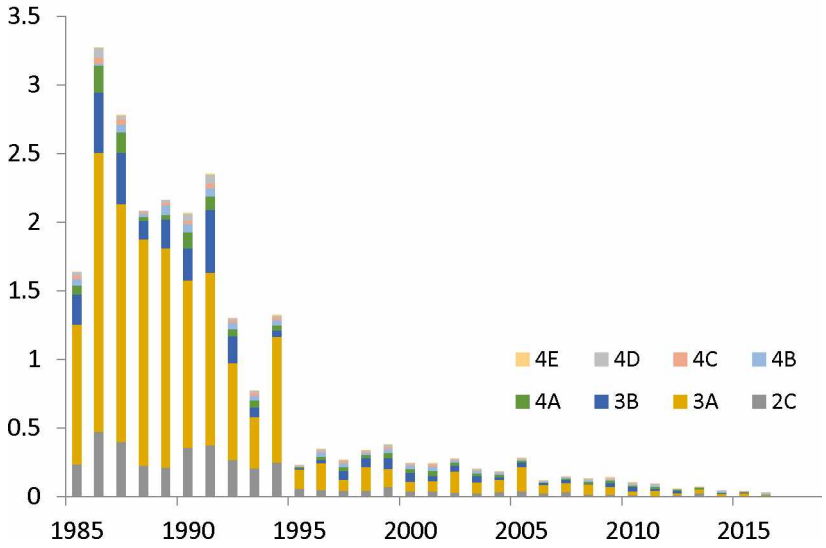

Figure 2.32. Halibut dead loss (million pounds) from lost or abandoned gear, 1985 through 2016.

Estimates of wastage, the discard mortality of undersized halibut in the halibut directed fishery, are represented in Figure 2.33. Wastage increases as a function of increases in halibut abundance, changes in halibut size-at-age, and fishing practices. For example, the elevated levels of wastage in the late 1980s through mid-1990s is an outcome of the derby fishery that led fishermen to fish near to port and to continue fishing on productive grounds even in the presence of large numbers of undersized halibut. Similarly, the increase of wastage between 1995 and 2010 can be related to the concomitant decline in size-at-age, while recent declines reflect major reductions in the TAC and increased effort by fishermen to avoid undersized halibut.

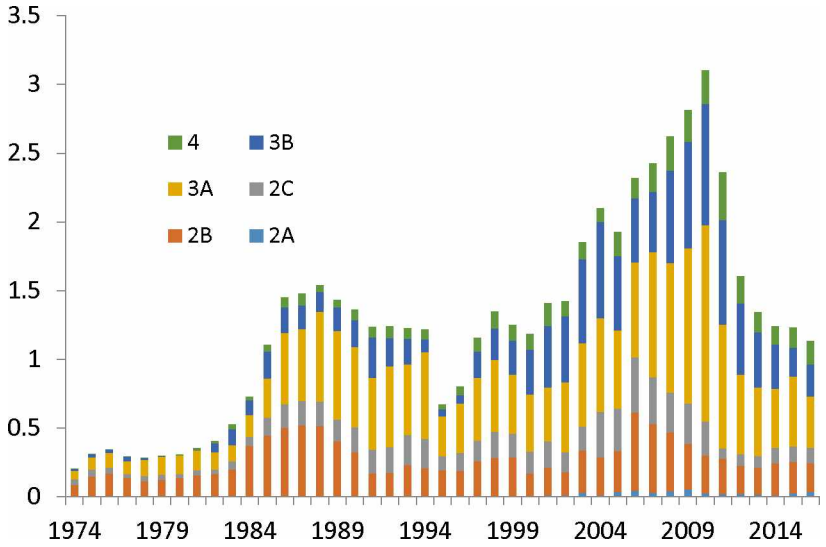

Figure 2.33. Total wastage (million pounds) of Pacific halibut, 1974 through 2016

Based on observations in British Columbia (IPHC Area 2B), where 100 percent of catches are monitored, it is estimated that wastage represents 18 percent of total fishing mortality (IPHC 2015). In contrast to the halibut fishery, the sablefish fishery is not subject to minimum size limits and there is little discard of small fish.

Time series observations of halibut bycatch mortality and sablefish bycatch mortality are represented in Figures 2.34 and 2.35. Prior to the introduction of IFQs, regulatory requirements forced the discard of most incidental catches of halibut in the sablefish fishery and most incidental catches of sablefish in the halibut fishery. Under the halibut and sablefish IFQ program, fishermen in each fishery could hold QS in the other fishery. That is, a sablefish fisherman who holds unused halibut IFQ corresponding to the size-category of their sablefish boat can retain incidental catches of legal-sized halibut and vice versa. Halibut and sablefish bycatch in other fisheries has become an increasingly important concern as reductions in halibut and sablefish TACs have not led to proportional reductions in bycatch caps. Nevertheless, as a result of declining abundance and bycatch reductions measures implemented by some sectors, the halibut bycatch mortality has declined since the early 1990s.

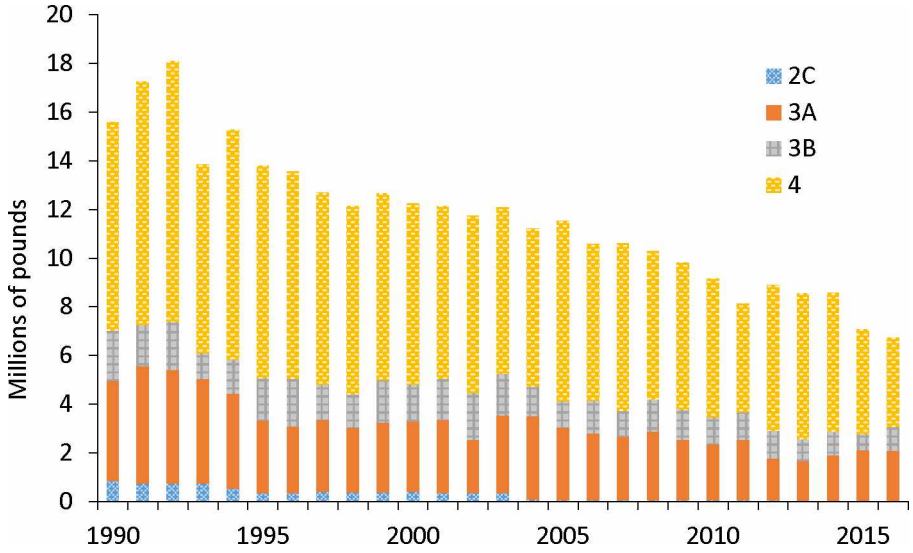

Figure 2.34. Bycatch mortality (million pounds) of Pacific halibut, 1990 through 2016.

Most of the halibut bycatch occurs in the high-volume trawl fisheries for Pacific cod, pollock, and yellowfin sole. In 2016, the BSAI trawl and fixed gear bycatch cap was 5.8 million pounds, a 23 percent reduction from the cap in effect during the preceding 19 years.

Bycatch in the sablefish fishery was 58.6 million pounds in 1991, with 57.6 million pounds retained and 688,000 pounds discarded (Figure 2.35). In 2016, sablefish bycatch had declined to 21.8 million pounds retained and 2.3 million pounds discarded (Figure 2.35). Sablefish bycatch is primarily encountered in

fisheries for pollock, Pacific cod, Atka mackerel, rock sole, Greenland turbot, and arrowtooth flounder (Hanselman et al. 2016).

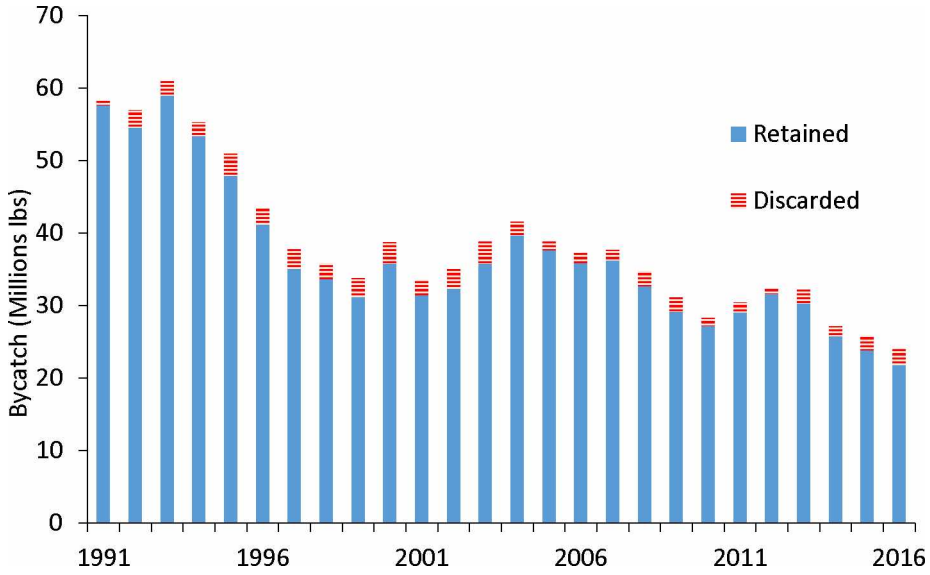

Figure 2.35. Bycatch mortality (million pounds) of sablefish, 1991 through 2016.

Changes in owner-operator provisions

In structuring the IFQ program, the NPFMC included design elements intended to favor a Jeffersonian ideal of small-scale owner-operators. The owner-on-board provisions were intended to prevent the emergence of a class of absentee owners able to extract rent from lessees contracted to do the actual fishing. However, those provisions created hardships for individuals temporarily unable to engage in the fishery due to unforeseen health problems, vessel losses, etc. In addition, the provisions effectively limited ownership to real persons, precluding communities or non-governmental organizations from acquiring quota shares. From shortly after implementation of the IFQ program, the NPFMC received requests to loosen these restrictions.

Hired Masters and Owner on Board

In addition to general transferring the QS holdings a QS holder can in some instances engage a hired master to fish their IFQ. As previously discussed, the IFQ program was designed to require QS holders to be on board the harvesting vessel, with the exception of CP (A) shares, which may be leased without restriction (Pautzke and Oliver 1997). IFQ use was restricted to maintain a predominantly owner-operated fishery. While the program allowed for continuation of pre-existing business arrangements, such as company-owned vessels

using hired masters, it was expected that eventually the CV sector would be composed exclusively of individual QS/IFQ holders directly engaged in the fishery (NMFS 2014).

In 1999 the hired master regulations were amended (64 FR 24960 June 9. 1999), requiring QS holders to demonstrate that they hold at least 20 percent ownership interest in the vessel that would be fished. Use of hired masters has proven controversial, and NMFS has seen some evidence of surreptitious leasing, such as QS holders failing to disclose that they hold less than a 20 percent ownership in the vessel used for fishing their IFQ or through entering into temporary purchases of vessel ownership interests to create the appearance of meeting the ownership requirements. Contrary to the intent that hired master provisions would serve as a temporary bridge during initial years of the IFQ Program (Pautzke and Oliver 1997) hired masters have come to be widely used throughout the first 22 years of the program.

In 2002, the IFQ program was amended (67 FR 20915) to modify the hired master provision to allow QS-holders to meet ownership requirements through an ownership interest in a corporation or other non-individual entity. In 2007, the NPFMC amended the IFQ program (72 FR 44795 August 7, 2007) to require QS-holders to present formal government issued documents to show that they have 20 percent ownership in the vessel before they were permitted to employ a hired master. In 2014, the NPFMC changed the vessel ownership requirement to a minimum of 12 months prior to applying to use a hired master and to prohibit use of a hired master for recently transferred QS (79 FR 9995 February 24, 2014). This rule was intended to eliminate a loophole that had allowed short-term ownership transfers to legitimize lease arrangements. This amendment was introduced to address anecdotal concerns that aging QS-holders were extracting 65 to 75 percent of the profit of the catch while the crew does the work (van der Voo 2016). The regulations provide for temporary exemptions to the vessel ownership requirements for vessels that are lost or which need extensive repairs.

In addition, in 2014, the NPFMC approved an amendment to prohibit use of hired masters to fish category B, category C, and use category D halibut CV QS and all sablefish CV QS transferred after February 12, 2010 (70 FR 43679 2014a). That action was challenged in 2016 and overturned in federal court (C14-5685 BHS; https://www.scribd.com/document/331762061/Order-in-hired-skippers-case). The court order changed the action date to December 2014 for halibut, leaving the February 2010 action date in place for sablefish (Seafood news Dec 6, 2016).

The percent of IFQ caught by hired masters has fluctuated over the past 22 years (Figure 2.36).

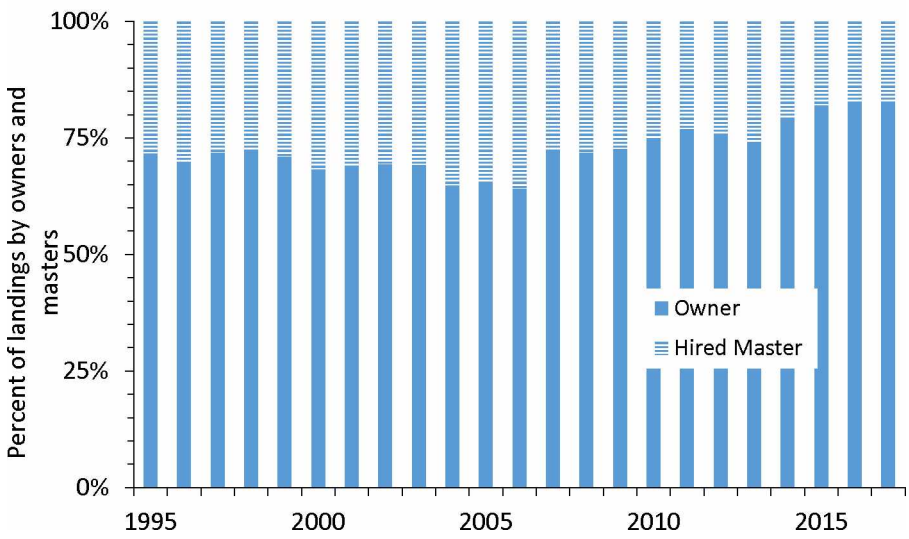

Figure 2.36. Share (percent) of halibut landed by QS owners and hired masters, 1995 through 2017.

Hired masters landed 6.4 million pounds of halibut in 2016, which represents over 37 percent of CV halibut IFQ landings (Figure 2.37).

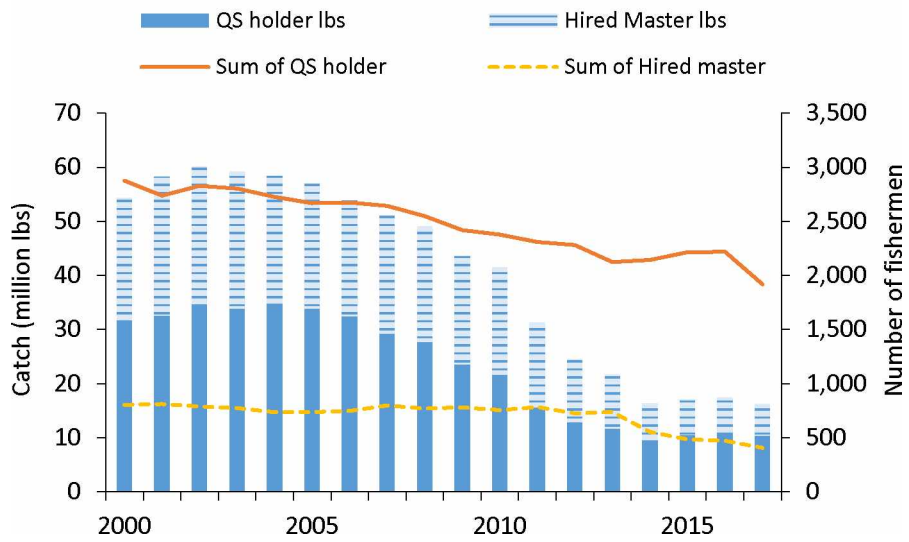

Figure 2.37. Catch (million pounds) by QS owners and hired masters and numbers of owners and hired masters for the halibut fishery, 2000 through 2017.

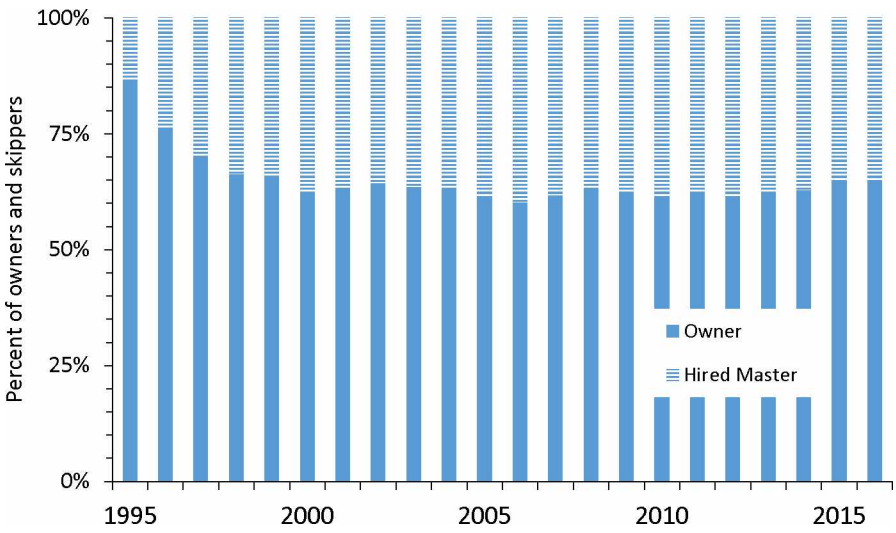

Figure 2.38. Share (percent) of sablefish landed by QS owners and hired masters, 1995 through 2017.

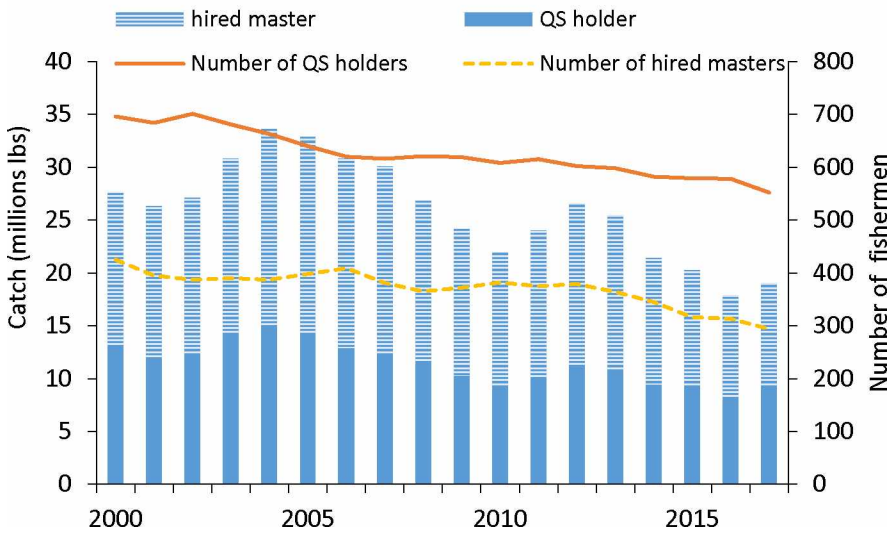

Figure 2.39. Catch (million pounds) by QS owners and hired masters and numbers of owners and hired masters for the sablefish fishery, 2000 through 2017. (Source: RAM 2017)

Szymkowiak and Felthoven (2016) found that hired masters based in the Seattle region are more likely to eventually move into owner-operator status than are hired masters based in Alaska. Halibut and sablefish boats based in Seattle have a network that helps the hired skippers acquire quota. This system is not as well established among fishing vessels based in Alaska where fishermen in small communities may not have the resources to support loans for hired skippers to buy into the fishery.

As the use of hired masters has become increasingly restricted, it is anticipated that emergency medical transfers will become the primary mechanism to evade owner-on-board requirements. However, emergency medical transfers currently account for less than five percent of total leasing in the halibut fishery.

As initial issues retire and as program restrictions become more binding, it is anticipated that the use of hired masters will decline.

Emergency medical transfers

The amount of IFQ leased out under emergency medical transfers is shown in Figure 2.40. Total poundage transferred averaged about 450 thousand pounds of halibut IFQ and 320 thousand pounds of sablefish IFQ from 2008 through 2015 but more than doubled between 2015 and 2017 (Figure 2.40). The recent increase in emergency medical transfers may reflect stricter regulation other provisions for use of hired masters.

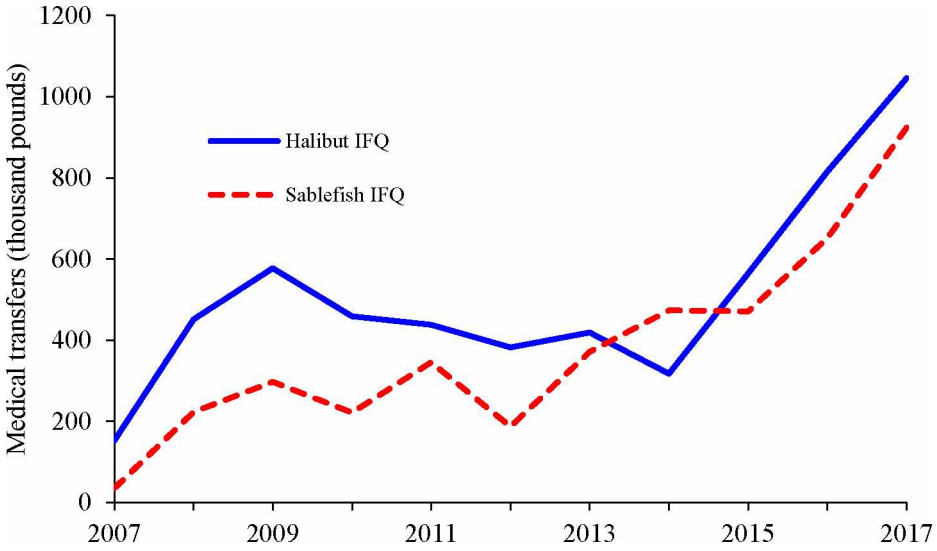

Figure 2.40. Emergency medical transfers (thousand pounds) in the halibut and sablefish fisheries, 2007 through 2017.

The importance of emergency medical transfers and the magnitude of recent trends in their use can be better appreciated when viewed as percentages the declining TAC for halibut sablefish. Since their introduction in 2007, emergency medical transfers have come to represent over six percent of the halibut TAC and just under five percent of the sablefish TAC (Figure 2.41).

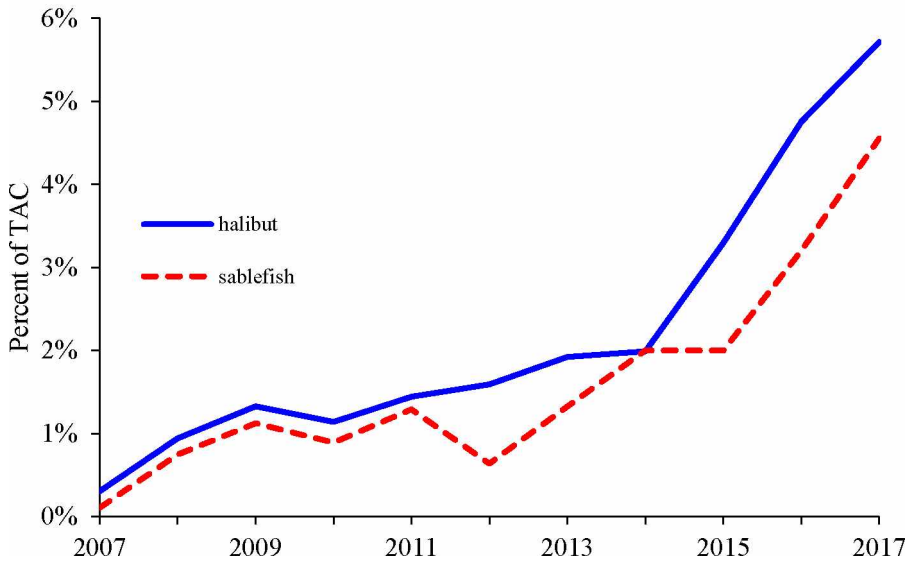

Figure 2.41. Percentages of halibut and sablefish TAC assigned to emergency medical transfers, 2007 through 2017.

Military transfers

There have only been a few applications of the military transfer provision. As with all other temporary or permanent transfer requests, NMFS reviews all applications and approves or denies transfers in accordance with program regulations.

Community Quota Entity Program

Several years after implementation of the halibut and sablefish IFQ program, smaller GOA communities noticed a significant decline in their engagement in these fisheries—fewer boats operating from their ports, few deliveries to local processors, fewer QS held by community residents, and fewer community residents employed as crew. In contrast, some communities appeared to have benefited from the increased engagement in the IFQ fisheries. Although this outcome had been anticipated (NPFMC 1991a), the magnitude of the shifts and extent of dissatisfaction with the shifts led the NPFMC to amend the ownership requirements of the IFQ program to allow certain GOA communities to form non-profit entities (Community Quota Entities; CQEs) to purchase QS for lease to community residents (69 FR 23681, April 30, 2004). Initially, only 42 GOA coastal communities were eligible for CQE quota. Since then, the NPFMC approved three additional communities to be added (78 FR 33243 June 4, 2013) to make the total 46 communities. Other communities are being considered for addition to the CQE program. To ensure compliance with program requirements, CQE entities are required to submit annual activity reports.

Since implementation in 2004, the CQE program has been broadened to include additional types of fishing permits. Under the charter halibut limited access program, eligible CQEs may request community charter halibut permits (CHPs) for use in Southeast Alaska or South-central Alaska). The CQE selects charter operators to use its community CHPs but retains ownership of the CHPs themselves. Vessels operating under a Community CHP need not be based within the CQE community but are subject to all applicable fishing regulations and must either begin or end their fishing trips within the community designated on the permit. In Southeast Alaska (IPHC Area 2C), there are 20 CQE CHP communities and 14 in the central GOA (IPHC Area 3A). While the intent of the CQE program was to increase resilience of small coastal communities, it has had little success in stemming declines in their engagement with the halibut and sablefish IFQ fisheries (Himes-Cornell and Kasperski 2016). To date, only five CQEs have purchased halibut or sablefish QS; 20 CQEs hold CHPs (NOAA 2017).

Pot longlining for sablefish in Bering Sea

The NPFMC had initially banned longlining pot gear for targeting sablefish because of potential for gear conflict with the halibut fisheries, but in April 1996, the NPFMC approved a regulatory amendment to allow the use of pot longlines for sablefish in the BSAI (Pautzke and Oliver 1997). Support for expanding the allowance of pot gear to additional areas has increased in reaction to the increased level of depredation by Sperm whale on hooked sablefish in the GOA and depredation by killer whale in the BSAI. The whale depredation has caused significant economic loss and damaged gear as well as reduced catch (NPFMC 2012; Peterson et al. 2014; Straley et al. 2015; Peterson and Hanselman 2017). In May 2015, the NPFMC approved the use of pot gear in the GOA and Southeast Alaska regions; the regulation went into effect in 2017. In Southeast Alaska, sablefish longlines are permitted fewer pots than in the GOA, AI, and EBS regions out of concern that allowing larger numbers of pots per longline might lead to elimination of the small boat fleet that currently fish using regular longline gear.

Sport Fisheries

The charter and self-guided sport fisheries for halibut have continued to evolve since implementation of the IFQ program. These changes have been driven by increases in tourism and a lack of effective individual or collective limits to sport catches of halibut, which led to a reduction in commercial TAC (Criddle 2004b). The NPFMC acted to stem the ongoing reallocation to the charter sector through tightened restrictions on charter harvests in Southeast Alaska and the Central GOA, intended to hold the charter sector to within its annual allocations, which had been exceeded by a combined 3.7 million pounds from 2004 to 2010 (Figures 2.42 and 2.43). In 2011, the NPFMC established the Charter Halibut Limited Access Program. This created a new Charter Halibut Permits (CHPs) for operators in the charter halibut fishery in regulatory Southeast Alaska (IPHC Area 2C) and the Central GOA (IPHC Area 3A). Charter vessels that operate in these areas

must have a valid CHP during each charter fishing trip. CHPs must be endorsed with the appropriate regulatory area and number of anglers (NOAA 2017). Since implementation, the charter halibut allocation has not been exceeded in Southeast Alaska (Figure 2.42); the allocation in the Central GOA continued to be exceeded until additional management measures were brought to bear in 2013 (Figure 2.43) (Meyers 2017).

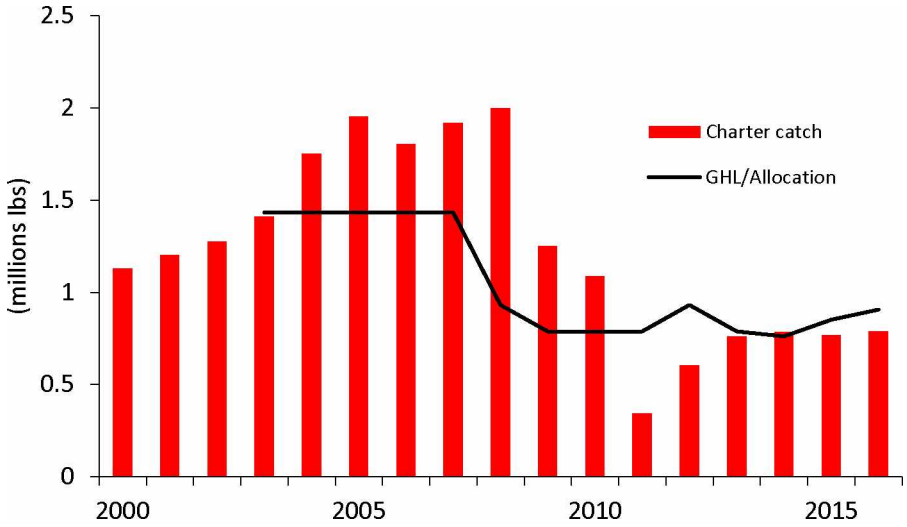

Figure 2.42. Charter halibut catches and GHL allocations (million pounds) in Southeast Alaska (IPHC Area 2C), 2000 through 2016.

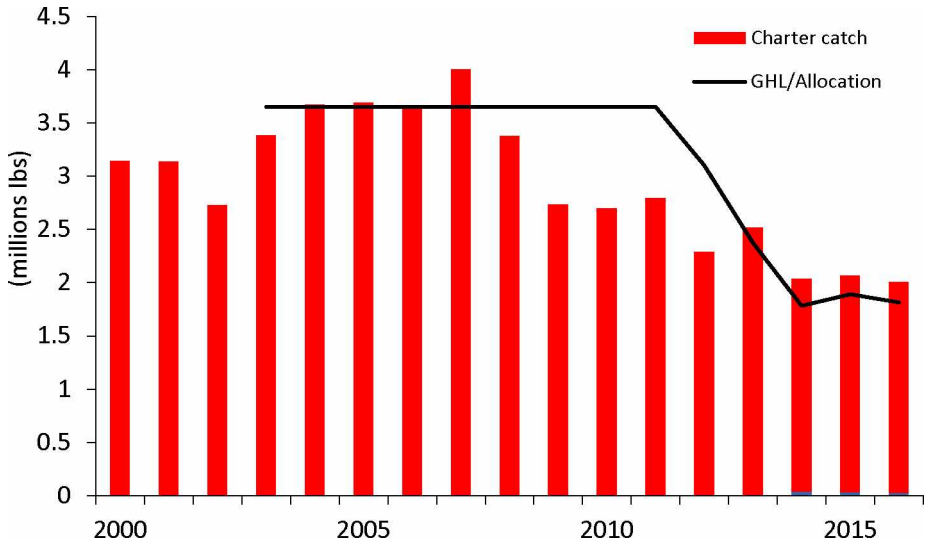

Figure 2.43. Charter halibut catches and GHL allocations (million pounds) in the Central GOA (IPHC Area 3A), 2000 through 2016

The halibut charter sector sought relief from the impact of measures, such as reductions in daily bag and possession limits and size limits, adopted to hold catches to below the charter allocation. In response, the NPFMC developed regulation to allow CHP holders to purchase guided angler fish (GAF), i.e., lease IFQ,

from QS holders. Charter operators with GAF can allow their clients to fish under the less restrictive self-guided angler bag, size, and possession limits (NOAA 2017). Szymkowiak and Himes-Cornell (2015) anticipate that GAF will further inflate the price of halibut QS.

Discussion

The Pacific halibut fishery has an impressive130-year history of, largely, successful management of this transboundary stock. This unique Alaskan fishery stands out as lucrative and complex to manage. While the sablefish fishery has a much shorter history, it became an important fishery in the Alaska region beginning in 1976, when the United States Congress extended the American jurisdiction in marine waters from three to 200 nautical miles.

This chapter follows the historical development of these fisheries through seven eras. The figures show the fluctuation of the fisheries due to different historical events that include the amount of fishing but also other aspects that affect the fisheries. The MSA extended United States jurisdiction to encompass much of the geographic range of these stocks but did not prevent the development of a race-for-fish that put the fisheries at biological and economic risk. Introduction of IFQs was intended to promote biological and economic sustainability. These fisheries were in poor health in the early 1990s, and a change in management structure was imperative to prevent overfishing and increase fishermen safety. The season had decreased from months in the 1970s to mere days (for halibut) or weeks (for sablefish). The halibut and sablefish fishermen were racing for increasingly smaller shares of the TAC; fish were worth less because they were landed in increasingly short seasons that precluded development of high-value fresh product markets; and the fisheries were becoming increasingly difficult to control (NOAA 1994; Criddle 1994). Both fisheries were experiencing high bycatch, lost gear, grounds congestion, compressed seasons, and high discard mortalities. (Pautzke and Oliver 1997).

While developing the policy for the IFQ program the NPFMC brought in specialists from New Zealand and Canada (regions where individual quota programs had been recently implemented). The consultant from New Zealand made it clear that many good things can come out of implementing an IFQ program, but that IFQ programs are not good for small boats (Behnken 2018). The NPFMC worked hard to add program elements to foster continuity in the composition of the fishing fleet and to prevent excessive consolidation and preserve the small-boat culture of these fisheries. This included owner- onboard requirements. The NPFMC also sought to preserve the nature and size of the fleet by setting caps on the amount of quota that can be held by a person or fished from a vessel and establishing transfer restrictions. The intent was to preclude large corporations from dominating the fishery as had occurred in the United States surf clam/ocean quahog IFQ (Weninger 1998; NRC 1999a) and in other IFQ fisheries, including in New Zealand and Canada.

In Alaska's halibut and sablefish IFQ program, QS are designated by specific vessel categories and regulatory areas. With six areas and three vessel categories for sablefish and eight areas and four vessel categories for

halibut, that is, 50 different categories of QS, thereby limiting the extent of consolidation of the fleet and preventing the fishery from being fished from one vessel category, as anticipated by economic theory and as played out in other IFQ fisheries. Maintaining diversity in the fleet with respect to vessel categories was a goal that was set by the NPFMC from the start of the program, a goal that has endured throughout the program's history. While flexibility has been introduced to address vessel safety concerns (in the Western GOA and AI) and to allow smaller vessels to fish QS designated for larger vessels, the flexibility was designed to prevent additional consolidation. Moreover, after an initial flurry of consolidation, the fleet size has stabilized in each region at a similar level set in the initial policy design.

One of the unforeseen consequences and criticisms of the initial issuees' privileges was the use of hired masters. In most regulatory areas, the IFQ program allows initial issuees (and corporations that were initial recipients of QS) to use hired masters to fish their IFQ. Once the magnitude of the loophole this created became apparent the NPFMC set about establishing stricter limits on the use of hired masters (Behnken 2018). In 2014, the NPFMC implemented a hired master provision that prevents initial recipients from acquiring additional catcher vessel QS for utilizing a hired master to land the resultant IFQ. There will continue to be a lag in the transfer of catcher vessel QS to second-generation, (owner-on-board shareholders) because initial catcher vessel QS recipients can still use hired masters to land their IFQ from QS transferred prior to 2010.

The Alaska halibut and sablefish IFQ program has been cited as a contributing factor to the decline of remote fishery-dependent communities (Carothers 2008). The nearly simultaneous collapse of salmon prices has also been cited as a factor driving the decline of remote fishery-dependent communities. Beginning in the 1990s, processing capacity began to migrate to larger rural communities and to urban communities. Permit holders and QS also migrated to larger, urban cities with freight connections. The elements that promote social and economic well-being of viable fishery-dependent communities are difficult to implement, although the NPFMC did amend the ownership requirements of the IFQ program to allow certain GOA communities to form CQEs empowered to purchase QS for lease to community residents (69 FR 23681, April 30, 2004). The CQE program has not proven as successful as expected and as of 2017, only four of the 46 communities eligible had purchased QS.

Some of the NPFMC's other concerns about these fisheries were addressed through increased management precision and lengthening the overall fishing season. Increased management precision eliminated overharvest. Longer seasons contributed to safety-at-sea (Hughes and Woodley 2007) and improved fish quality (Terry 1993). In the sablefish fishery, IFQ management led to increased catch rates and decreased harvests of immature fish (Sigler 2001). While some processors lost revenues under the transformation to IFQs (Matulich and Clark 2003; Herrmann and Criddle 2006), Love (1995) argues that the change was needed to wrest monopsony power from the fish processors.

While the NPFMC was concerned about the economic viability of the halibut and sablefish fisheries, it did not set out to structure the program to maximize economic efficiency. Kailian (2015) estimates that social provisions in the Alaska halibut and sablefish IFQ program reduced the net economic benefits to QS holders by 25 percent in the halibut fishery and by nine percent in the sablefish fishery. This loss of economic efficiency is the cost of measures designed to retain the small-boat, owner-operator character of the fishery.

IFQs have contributed to increased management precision through accurate real-time monitoring of landings. Together with limits to allowable overages at the individual QS-holder level, there is little possibility of exceeding the TAC. Nevertheless, results in terms of biological sustainability have been mixed. Although the halibut and sablefish fisheries are among the most intensively studied in the world, stocks of both species have declined in recent years. The IPHC and NMFS have responded to these declines by introducing ever more sophisticated methods to assess stock abundance and demographic composition and to model stock dynamics (IPHC 2016; Hanselman 2016a). It is hoped that continued improvement of these models will add to the understanding of processes that govern the response of these stocks to changes in the environment and changes in fishing practices and fishing regulations, enabling more precise anticipation of how changes in the environmental conditions and social systems will affect stock trajectories.

In addition to biological sustainability, the sustainability of fishery social-ecological systems requires maintenance of conditions that promote the social and economic well-being of fishermen and their communities. Brinson and Thunberg (2016) compare 16 United States catch share programs in terms of common goals and expected impacts. The Alaska halibut and sablefish IFQ program rates high on their performance measures. Capacity, as measured by reductions in active vessels, has been reduced. Prices have improved, average revenue has increased, and season length has increased which has been an advantage for the economic performance of the fisheries. However, they note that some communities have seen reductions in their engagement in these fisheries.

The Alaska halibut and sablefish IFQ program is a unique program with harvesting privileges tightly regulated by the government to maintain the original character of the fishery. However, program features that limit the free working of the marketplace result in losses of economic efficiency from the perspective of QS holders and lead to increased government administration and infrastructure costs (Smith 2000). As policymakers consider design features to achieve social goals, they should be aware that such features generally require expanded government oversight. In addition, when political influence is involved in developing new amendments, the result often does not maximize the economic benefits to society (Criddle 2004a). Fisheries are political arenas where power dynamics can and do affect policy choices.

The Alaska halibut and sablefish IFQ program is one of the largest and most successful of the United States catch share programs and has been successful in maintaining these fisheries for the past 22 years. Fisheries managers will continue to monitor and update regulations to keep the fishery healthy and economically profitable. The development of new IFQ programs can benefit from lessons learned in the development and evolution of the Alaska halibut and sablefish IFQ program. No two fisheries are the same, thus each IFQ program needs to be customized to reflect the unique biology and ecology of the managed stock as well as the unique social, economic, and political milieu. Perhaps one of the most important take-home lessons of the Alaska halibut and sablefish IFQ program is that program design and redesign are ongoing processes needed to reflect changes in the managed stock and in social objectives. The Alaska halibut and sablefish IFQ program is being continuously customized and molded to fulfilling the goals that it was originally set up to accomplish as well as to meet emerging goals.

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Appendix 2.1 : Amendments to the Halibut and Sablefish IFQ Program, 1995 to present.

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
1995	Implemented IFQ program for halibut and sablefish fixed gear fisheries. Prohibited use of pot gear in GOA and prohibited use of longline pots in the BS	NA	All	All	All	All	50 CFR 679.41
1995	Restricted ownership of blocked (initial allocation <20,000 lbs.) QS to no more than two blocks. Allowed "sweep-up" of small blocks into blocks of up to 1,000 lbs. (halibut) or 3,000 lbs. (sablefish)	M	All	All	All	All	
1996	Eliminated 72-hour "fair start" (no fishing) requirement before the opening of the sablefish season	L	All	S	All	All	
1996	Eased requirement that an IFQ holder remain onboard the vessel until the fish are offloaded	L	All	All	All	All	
1996	Allowed transfer of QS/IFQ to surviving spouse of QS holder	L	All	All	All	All	
1996	Eased restrictions on salmon fishermen making deliveries of IFQ to tenders	L	All	All	All	All	
1996	Allowed IFQ shipment reports to be submitted up to one week after the shipment occurs	L	All	All	All	All	
1996	Allowed CV IFQ to be "fished-down", fished on vessels in smaller than the designated QS vessel category	L	All	All	All	All, except 2C and SE for IFQs >5,000 lbs. or un-blocked QS	50 CFR 679.40
1996	Eased "sweep-up" limits to allow consolidation of small QS blocks of up to 3,000 lbs. (halibut) or 5,000 lbs. (sablefish) (based on 1996 QS pools and TACs)	L	All	All	All	All	
1996	Added Akutan to CDQ communities	L	C	All	All	BSAI	
1997	Required corporations and partnerships that hold QS to designate a "hired skipper" to harvest their 1997 IFQ; the QS holder must own all or part of the vessel on which the hired skipper will fish its IFQs	M	All	All	All	All	
1997	Allowed longline pot gear for sablefish in the Bering Sea, except in June	L	All	S	LP	BS	
1997	Required 6-hour prior notice of landing if landing will take place either before or more than 2 hours after the date/time originally scheduled	M	All	All	All	All	

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
1998	Prohibited leasing of catcher vessel IFQ	M	All	All	All	All	
1999	Required deployment of seabird avoidance devices to reduce bycatch	M	All	All	All	All	
1999	Required corporations and partnerships that hold QS to designate a "hired skipper" to fish their IFQs and demonstrate that they hold at least a 20 percent ownership interest in the vessel upon which the hired skipper will fish; indirect ownership allowed with sufficient documentation	M	All	All	All	All	64 FR 24960
1999	Required that Registered Buyers report port codes for IFQ landings	M	All	All	All	All	
1999	Changed logbook recordkeeping and reporting requirements (single, combined IFQ/ groundfish logbook)	L	All	All	All	All	
1999	Established a title and lien registry (MSA)	N	All	All	All	All	
1999	Revised IFQ overage to deduct overages of up to 10 percent from following year's IFQ account, with no penalty	L	All	All	All	All	62 FR 26246
1999	IFQ overage >10 percent is a violation	M	All	All	All	All	
1999	Revised halibut CDQ fishing management starting in 1999	N	C	H	All	BSAI	
2000	Required cost recovery fees up to 3 percent by January 31 of the following year (MSA)	M	I	All	All	All	
2002	Extended surviving spouse allowance to designated beneficiary in the absence of a spouse	L	All	All	All	All	
2002	Increased QS use cap to 1.5 percent of all QS (in fixed 1996 QS units)	L	All	H	All	BSAI	
2002	Established a 2 percent standard deduction for ice and slime on unwashed IFQ species; established separate product codes	L	All	All	All	All	FR 66 41671 66 Fed. Reg. 41664
2002	Revised definition of "a change in the corporation or partnership" to specify when estates holding initial QS allocations must transfer QS to a qualified individual	M	All	All	All	All	
2002	Allowed "indirect" ownership of a vessel by a QS holder who wishes to hire a skipper to fish their IFQ	L	All	All	All	All	67 FR 20915
2002	Required only sablefish QS/IFQ permit holders to follow Federal IFQ regulations in state waters	L	All	All	All	All	
2002	Defined "IFQ landing" to include "trailering" (removal from the water of a vessel that contains IFQ harvests)	M	All	All	All	All	

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
2002	Exempted lingcod fishermen using dinglebar gear from the 6-hour prior notice of landing and 12-hour landing window requirements if they hold halibut IFQ and land <500 lbs. of halibut bycatch along with their legal lingcod landings	L	All	All	All	All	67 FR 32084
2002	Specified which Registered Buyer is responsible for filing shipment reports for IFQ	M	All	All	All	All	67 Fed. Reg. 4100
2002	Allowed electronic appeal of Initial Administrative Determination	L	All	All	All	All	68 Fed. Reg. 28889
2003	Reduced 6-hour prior notice of landings to 3 hours; replace declaration of intent to land at a specific Registered Buyer with offload location	L/M	All	All	All	All	68 Fed. Reg. 10989
2003	Revised transfer report and replaced IFQ shipment report	L	All	All	All	All	68 Fed. Reg. 28889
2003	Replaced primary port clearance requirement for IFQ/CDQ halibut and IFQ sablefish fishing vessels leaving Alaska with verbal departure report	L	All	All	All	All	68 Fed. Reg. 3485
2003	Extended duration of Registered Buyer permit to 3 years	L	All	All	All	All	68 Fed. Reg. 71235
2003	Modified management of “other species” CDQ reserve	L	C	All	All	All	68 FR 60327
2003	Implemented a guideline harvest level (GHL) for sportfishing catches of halibut in Area 2C and Area 3A	M	S	All	All	2C/3A	68 FR 47256
2003	Increased Area 4E trip limit and modified the Area 4 Catch Sharing Plan to allow participants to harvest allocations of Area 4D halibut CDQ in Area 4E	L	C	H	All	All	68 FR 9902
2003	Exempted vessels carrying VMS transmitters from IPHC vessel clearance requirements	L	I	H	All	BSAI	68 Fed. Reg. 10989
2004	Allowed 42 designated GOA communities to form non-profit CQEs to purchase and hold QS	L	All	All	All	GOA	69 Fed. Reg. 23681
2004	Required CV operators to retain and land all demersal shelf rockfish caught while fishing for groundfish or IFQ halibut	M	I	H	All	GOA	69 Fed. Reg. 68095
2005	Allowed Area 4C halibut QS holders to harvest in either Area 4C or Area 4D	L	A	H	All	BSAI	70 Fed. Reg. 43328
2005	Prohibited halibut IFQ permit holders from fishing or anchoring in Sitka Pinnacles Marine Reserve	M	I	H	All	GOA	70 Fed. Reg.53312

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
2005	Simplified quota transfers, authorized vessels, and approval of alternative fishing plans	L	C	All	All	All	70 Fed. Reg. 62369
2006	Excluded certain tagged catch from deductions from accounts	L	A	All	All	All	71 Fed. Reg.36489
2006	Changed calculation of direct program costs under IFQ Cost Recovery Program	L	I	All	All	All	71 Fed. Reg.44231
2007	Prohibited additional harvest in state waters after IFQ permit holder caught all IFQs	M	I	S	All	All	72 Fed. Reg. 35747
2007	Allowed category B QS to be fished on vessels ≤ 60 feet LOA in Area 2C (halibut) and Southeast Outside (sablefish)	L	I	All	All	2C/SE	72 Fed. Reg. 44795
2007	Allowed category D QS to be fished on vessels ≤ 60 feet LOA in Areas 3B and 4C	M	I	All	All	All	72 Fed. Reg. 44795
2007	Allowed temporary IFQ transfers for medical reasons	L	I	All	All	All	72 Fed. Reg. 44795
2007	Required documentation of vessel ownership for use of hired skippers	M	I	All	All	All	72 Fed. Reg. 44795
2007	Replaced "card" with "hired master permit"	N	A	All	All	All	73 Fed. Reg. 28733
2008	Revised seabird avoidance requirements	M	A	All	Longlines	All	72 Fed. Reg.71601
2008	Allowed processing of non-IFQ groundfish species when halibut is processed on board	L	A	H	Longlines	All	72 Fed. Reg. 64034
2008	Allowed use of pot longlines in June	L	A	S	Pot Longlines	BS	72 Fed. Reg. 35393
2008	Allowed active duty members of National Guard and military reserves to temporarily transfer IFQs to other eligible permit holders	L	A	All	All	All	73 Fed. Reg. 28733
2008	Increased online security by removing permit numbers	N	A	All	All	All	73 Fed. Reg. 76136
2009	Relaxed seabird avoidance requirements	L	A	H	Longlines	4E	74 Fed. Reg. 13355
2009	Allowed: QS holder to hold three blocks; blocks > 20,000 lbs. to be divided into one 20,000 lb. block and remainder unblocked in Area 3B and 4A; increased sweep-up limit to 5,000 lbs. in Area 2C and 3A	L	A	H	All	2C, 3A, 3B, 4A	50 CFR 679.42
2009	Allowed Category D QS to be harvested on vessels ≥ 60 feet LOA ("fished up")	L	A	H	All	3B, 4C	74 Fed. Reg. 21194
2009	Allowed Category B QS to be harvested on any length CV ("fished down")	L	A	All	All	2C/SE	74 Fed. Reg. 21194
2010	Clarified owner-onboard requirement	L	I	All	All	All	

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
2010	Allowed CQEs to receive charter halibut limited access permits	L	A	H	ALL	GOA	76 Fed. Reg. 44155
2011	Allowed CQEs to receive non-trawl groundfish limited license permits (LLPs) endorsed for Pacific cod in the central or western GOA	L	A	H	ALL	GOA	76 Fed. Reg. 44155
2011	Implemented charter halibut limited access program (CHLAP)	M	I	H	S	2C.3A	76 Fed. Reg 54739
2012	Canceled inactive QS held by persons who never used IFQ in any regulatory area	M	I	All	All	All	77 Fed. Reg 29556
2012	Established observer coverage requirements	M	A	All	All	All	77 Fed. Reg. 70061
2012	Established a CQE Program in Area 4B	L	CQE	H	All	4B	77 Fed. Reg. 2038
2012	Allowed "fishing-up" in Area 4B	L	A	H	All	4B	77 Fed. Reg. 5473
2013	Allowed IFQs to be leased by charter sector; separate accountability	L	I	H	All	2C, 3A	79 Fed. Reg. 34251
2013	Allowed CQEs to purchase category D QS in Area 3A.	L	CQE	All	All		78 Fed. Reg. 68390
2013	Added three communities to the list of CQE eligible communities	L	CQE				78 Fed.Reg. 33243
2014	Allowed category D QS to be fished on category C CVs in Area 4B	L	A	H	All	4B	76 Fed Reg 44699
2014	Required corporations and partnerships that hold QS to hold minimum of 20-percent ownership interest in vessel for at least 12 consecutive months prior to hiring a master; exempted initial recipients whose vessel has been totally lost or requires at least 60 days to be repaired	M	A	All	All	All	79 Fed Reg 9995
2014	Prohibited initial individual QS recipient to use a hired master to harvest CV IFQ they transferred after February 12, 2010	M	I	All	All	All	70 Fed Reg 43679
2014	Revised vessel use caps applicable to sablefish QS held by GOA CQEs	L	I	All	All	GOA	78 Fed Reg 33243
2015	Pacific Halibut Catch Sharing Plan for Areas 2C and 3A	M	I	H	All	2C/3A	78 Fed Reg 75844
2014	Extended CQE program to area 4B (halibut) and the AI area (sablefish); the community of Adak formed a CQE	M	I	All	All	4B	78 Fed Reg 68390
2017	Allowed use of longline pot gear for sablefish in the Western GOA.	L	I	H	POT	GOA	81 Fed Reg 95435
2018	Allow CDQ groups to lease IFQ halibut from 4b 4c and 4d in years of low halibut catch limits	L	CDQ	H	All	4B, 4C,and 4D	83 Fed Reg 52760.
2018	Authorize Recreational Quota Entity RQE To Participate in the Halibut IFQ Program	M	I	H	All	2C/3A	84 Fed Reg 47819

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species H/S	gear	area	Reference
2019	Charter Halibut Permits (CHPs) to be registered annually with NMFS	M		H		2C/3A	84 Fed Reg 64023
	ANTISIPATED						
2020	Revised IFQ Medical Transfer Provision	M	All	All	All	All	Proposed rule 84 FR 56991
2020	Revised IFQ Beneficiary Designation	M	All	All	All	All	Proposed rule 84 FR 56991
2020	Allowed retention of halibut taken incidental to sablefish caught using pot gear	L	B	H	All	BSAI	Proposed rule
2020	Fish up						Proposed rule
2020	Non-guided halibut rental boat registration –	M	H	H		2C/3A	Initial Review
2020	Halibut in pots						Proposed rule

Chapter 3. Characterizing Crew and Fuel Price Impacts: A Survey of Pacific Halibut and Sablefish Quota Share Holders

Abstract:

In February 2010, the University of Alaska Fairbanks and the Alaska Sea Grant conducted a mail out survey to quota share (QS) holders of the Alaska IFQ program for halibut and sablefish. This survey was conducted to gather more information on crewmembers and cost of fuel prices for the Alaska halibut and sablefish fishery. Specifically, we targeted the survey to look at trends in the fishery as they relate to the number of full- and part-time crew positions, the extent to which QS holders fish from their home port, and the locations where gear and supplies are purchased. The survey also collected QS-holder perceptions about the impacts of recent variations in fuel prices and operation costs, and the chances of a QS holder purchasing more halibut or sablefish quota shares in the future.

The survey was mailed to a stratified random sample of 895 halibut QS holders and 400 sablefish QS holders. The stratification was divided into 12 areas to better characterize possible differences among QS holders in different vessel classes. A total of 1,295 surveys were distributed by mail and 365 were returned. Returned rates varied from 16% to 37% in relation to the stratification. In addition, there was an online version of the survey that received 69 responses not included in the control group.

The six-part survey begins with a series of questions (questions 1–5) about whether the respondent fishes from his/her own vessel or on another's vessel, the number of crew onboard when QS is being fished, and the number of QS holders aboard when QS is being fished. The second section surveys the residency of crew in relation to where they fish (questions 6–9). The third section surveys the difficulties of hiring crew and asks about home port and where supplies are purchased (questions 10–12). The fourth section surveys the percentage of gross revenues spent on operational costs (questions 13 and 14). Impacts of changes in fuel prices are analyzed in questions 15–18. The final section (questions 19–22) explores a QS holder's interest in purchasing additional halibut or sablefish QS.

Results showed that the crew in certain areas on smaller vessels tended to be drawn from the local region while the crew on the larger vessels in more remote areas tended to be drawn from outside the local region. Results also showed that more remote areas of Alaska tended to have higher operating costs and greater difficulty finding crew compared to areas of Alaska that had larger population bases. Financing to purchase more QS for halibut and sablefish was more difficult to obtain for those in remote areas but these same areas had the highest response to purchase more QS (Area 4, halibut; AI, in sablefish) Preliminary results of the survey were released in January 2011 and this more comprehensive analysis was completed in the spring of 2012.

3.1 Introduction

The Alaska halibut and sablefish Individual Fishing Quota (IFQ) program was adopted in 1991. The North Pacific Fishery Management Council (NPFMC) voted to recommend implementation of an (IFQ) program for the halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria*) fisheries off Alaska. The proposed structure of the recommended plan was approved by the Secretary of Commerce in 1991 and implemented in January 1995. IFQs changed the fundamental character of the halibut and sablefish fisheries from temporally compressed derbies into a more manageable fishery.

The NPFMC implemented the program with the goals of spreading out the season, increasing the ex-vessel price, improving safety, and reducing congestion on the grounds (CFEC 1995). An additional goal of the NPFMC was to avoid radically restructuring the fishery. The NPFMC did this by placing constraints on the amount of quota share that could be held by one person and the amount of IFQ that could be fished from a single vessel (CFEC 1996). There is some evidence that the IFQ program has met some of the NPFMC's goals; however, there continues to be concern about the long-term potential changes that might occur under the IFQ program. This is particularly true with Alaska's coastal communities that depend on commercial fishing for their economic base (Dinneford et al. 1999). A recent study that looked at small remote fishing communities from 1995 to 1999 suggests that residents in these communities are more likely to sell than buy quota (Carothers and Lew 2010).

The halibut and sablefish IFQ fisheries have become very important for the economy of Alaska and the Pacific Coast. In 2010, 1,090 halibut IFQ vessel landings totaled 54.8 million lbs. with the total fishery value over $200 million, an increase of $65.8 million over the 2009 value. For sablefish 363 IFQ vessel landings totaled 25.2 million lbs. with a value of $88.4 million (NOAA State of the coast). In 2011 there was a strong demand for fresh halibut which has led to record price in homer from $6.55 to $7.40 per pound. There has also been a strong demand in overseas markets for sablefish which has set a record in Homer with the price ranging from $6.05 to $9.35 (Welch 2011).

Alaska's Pacific halibut and sablefish IFQ fisheries are widely regarded as well-managed. Managers of these fisheries have been on the forefront of fisheries science in developing methods for understanding the population dynamics and in setting quotas that avoid overfishing.

Previous studies of Alaska's IFQ halibut and sablefish fisheries have included surveys of registered buyers, analyses of changes in safety, and assessments of effects of IFQs on conservation and management issues; only one report, ISER (1995) mentions crew ISER (1998) examined changes in fishing safety and changes in unreported discards. Dewees examined the British Columbia halibut fishery effects on crew during the transition of the fishery to an individual vessel quota system (2006).

This survey is specifically designed` to focus on characterizing crewmembers and includes a question on the effects of cost variation in fuels on fishing under the IFQ program. Specifically, this survey questions fishermen on the following topics:

- trends in the fishery as they relate to the number of full- and part-time crew positions
- the extent to which Quota Share (QS) holders fish from their home port
- recruiting qualified crew
- locations where gear and supplies are purchased
- costs for fuel, insurance, bait, gear maintenance, and vessel and crew share
- QS-holder perceptions about effects of recent variation in fuel prices
- purchasing more quota share in the future

This report provides baseline information for other researchers investigating the Alaska halibut and sablefish IFQ fishery. It also provides information to help QS holders better understand some of the areas that have not been covered in previous studies.

3.2 Methods

In February 2010, the University of Alaska Fairbanks and Alaska Sea Grant conducted a mail out survey of a stratified random sample of 895 halibut QS holders and 400 sablefish QS holders. The purpose of the stratification was to characterize possible differences among QS holders in different vessel classes and regions as well as differences between small (less than 20,000 pounds) and large (20,000 lbs. or more) QS holders. The survey was designed to collect information on recent trends in the fishery as they relate to the number of full- and part-time crew positions, locations where gear and supplies are purchased, the extent to which QS holders fish from their own vessels or from vessels owned by others, and QS-holder perceptions about the impact of recent variation in fuel prices, halibut catch limits, etc.

The halibut IFQ program created four QS classes based on vessel size and whether the vessel was equipped to freeze its catch:

A shares—QS initially allocated to large vessels that had the capability to freeze halibut onboard;
B shares—QS initially allocated to catcher vessels greater than 60 feet overall length;
C shares—QS initially allocated to catcher vessels between 36 and 60 feet overall length;
D shares—QS initially allocated to catcher vessels less than 35 feet overall length.

Area-specific halibut quota shares were allocated for each of the four vessel categories in each of the eight International Pacific Halibut Commission (IPHC) Management Areas (2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E) off Alaska (Figure 3.1).

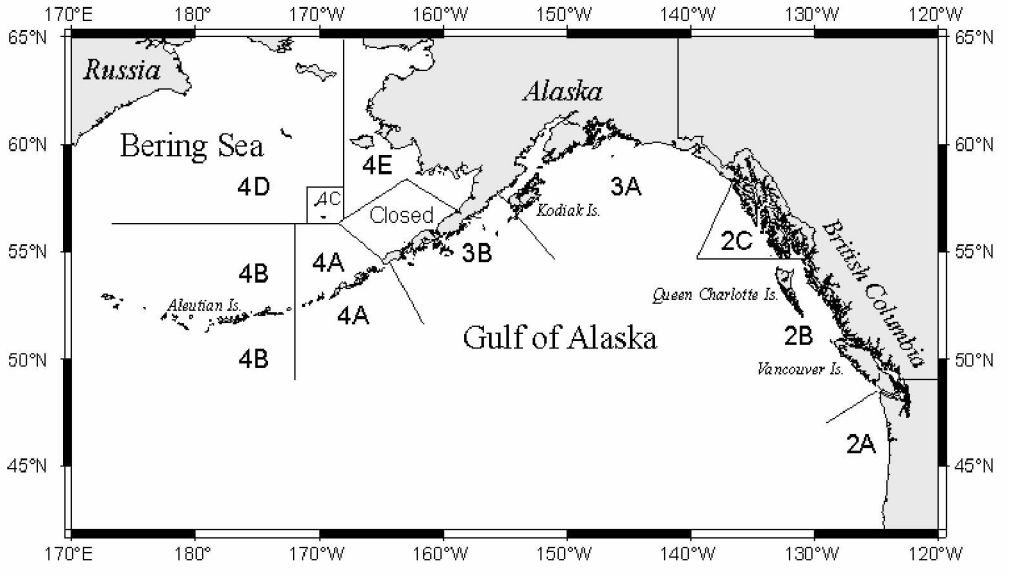

Figure 3.1. IPHC Management Areas. (Source: IPHC)

Survey was only administered to Alaskan QS holders and did not include Area 2B and Area 2A. (Source: NMFS, 2011).

The Sablefish IFQ program created three classes of QS based on vessel size and whether the vessel was equipped to freeze its catch:

A shares—QS initially allocated to large vessels that had the capability to freeze sablefish onboard;

B shares—QS initially allocated to catcher vessels greater than 60 feet length overall;

C shares—QS initially allocated to catcher vessels less than 60 feet.

Area-specific sablefish QS were allocated for each of the six sablefish management regions (Bering Sea, Aleutian Islands, Western Gulf of Alaska, Central Gulf of Alaska, West Yakutat, and Southeast Outside) off Alaska (Figure 3.2).

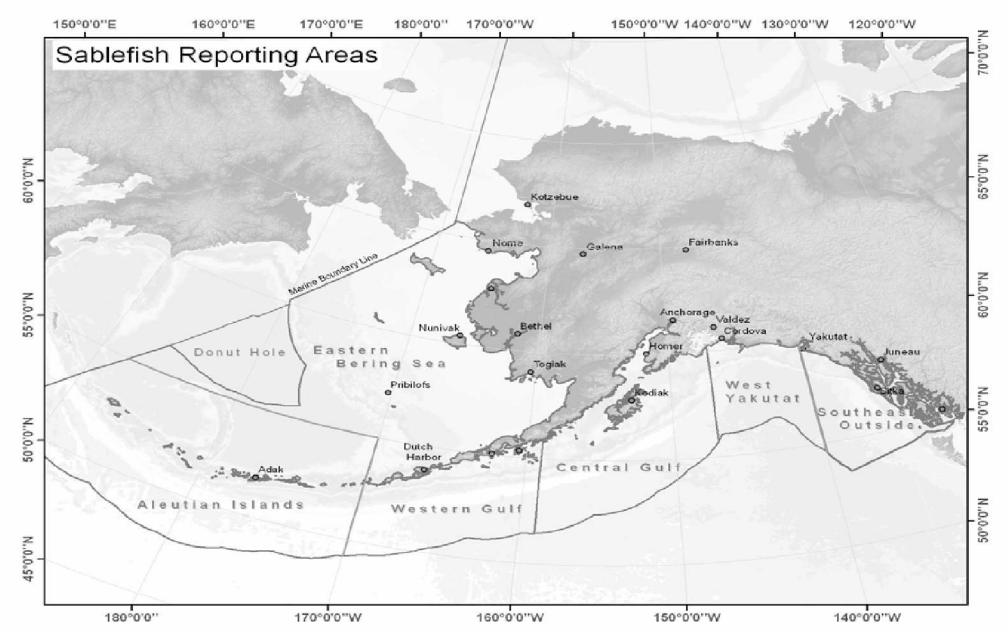

Figure 3.2. Sablefish management regions. (Source: NMFS)

Because the number of halibut QS holders in IPHC Areas 4A-E is fairly small, the five areas were aggregated into a single Bering Sea stratum. A total of 28 strata were defined for the halibut fishery: four management areas by four vessel categories with small (less than 20,000 lbs.) and large (20,000 lbs. or more) operation scale strata for B-, C-, and D-class shares. A total of 30 strata were defined for the sablefish fishery: six areas by three vessel classes with small (less than 20,000 lbs.) and large (20,000 lbs. or more) operation scale strata for B- and C-class shares.

The survey was designed to ask specific questions on recent trends in the fishery as they relate to the number of full- and part-time crew positions, locations where gear and supplies are purchased, and the extent to which QS holders fish from their home port. The questions were designed to be concise and clear to the IFQ QS holder. Industry members, researchers, and agencies provided detailed advice on the questionnaire design.

3.3 Results and Discussion

Survey instrument and response rate

The survey was mailed out to a stratified random sample of 895 halibut and 400 sablefish QS holders. The survey was stratified to better characterize possible differences among QS holders in different vessel classes and regions as well as differences between small (less than 20,000 lbs.) and large (20,000 lbs. or

more) QS holders and vessel classes (Freezer A class, B class, C class and D in halibut). The survey was designed to collect information from vessel owners and QS-holders about the impact of recent variations in fuel prices, halibut catch limits, and other topics. Post cards were sent 3 weeks after the survey was sent to remind participants to complete the survey. Survey response rates are summarized in Table 3.1 and Table 3.2.

Table 3. 1 Sample size

	Halibut	Sablefish
Sample size (number of survey mailed)	895	400
Number of complete surveys returned	254	111
Returns by size and type total		
A share and QS holders over 20,000 lb.	112	59
QS holders under 20,000 lb.	142	52

Table 3.2 Response rate

	Sent	Returned
A Share Halibut Freezer	47	11
B Share Halibut >20000	141	46
B Share Halibut < 20,000	126	20
C Share Halibut >20,000	142	46
C Share Halibut <20,000	164	39
D Share Halibut >20,000	24	9
D Share Halibut < 20,000	251	83
A Share Sablefish	63	11
B Share Sablefish >20,000	62	13
B Share Sablefish <20,000	58	18
C Share Sablefish >20,000	108	35
C Share Sablefish <20,000	109	34
Total	1,295	365

The response from the survey was a random cross section of the IFQ populations that met the goal of being a stratified sample. This response rate was average compared to most mail surveys. The completed survey was returned for a total response rate of 28.2 percent. Response rates for individual sample size varied from a low of 15.9 percent for halibut B share less than 20,000 lbs to a high of 37.5 percent for halibut D share over 20,000 lbs.

Figure 3.3 shows locations of the responses for the survey; the larger the dot, the more response from the locations. This map does show a similar distribution of the halibut QS population.

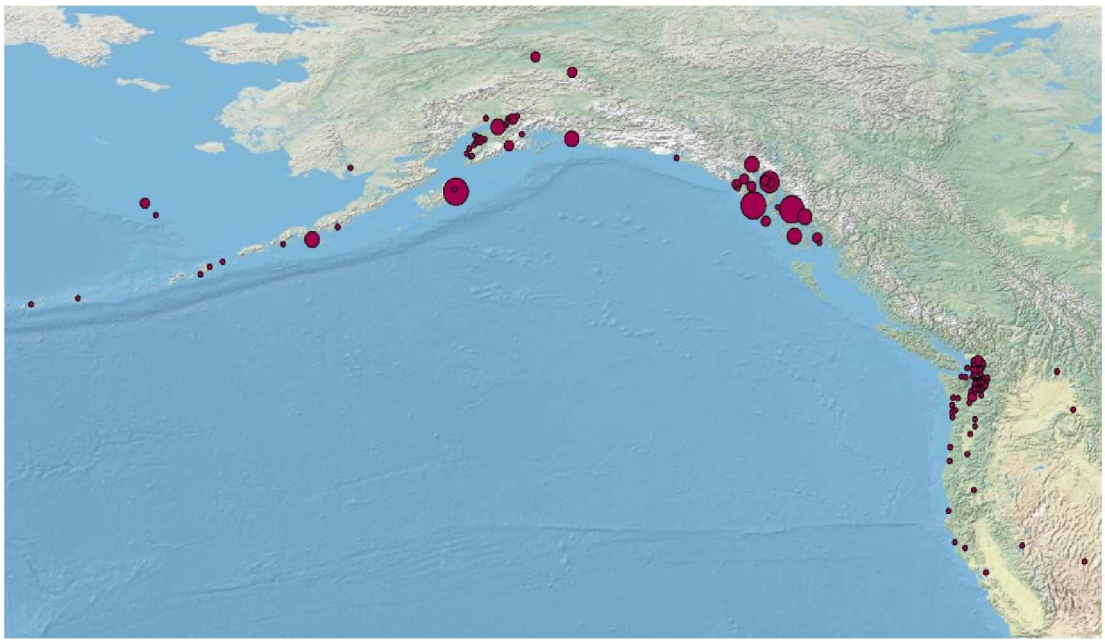

Figure 3.3. Map of responses, the wider the dot more response)

The first section of the questionnaire asks QS holders if they fished from their own vessel, the number of crew onboard when their quota share is being fished, and the difference in the number of QS holders aboard when fishing in 2009. This section shows some of the decision-making processes associated with the number of crew on halibut and sablefish IFQ vessels.

Question 1: What percent of halibut QS holders fished from their own or another's vessel

Question 1 explored trends in the fishery as they relate to the number of IFQ holders who fished from their own vessel. Results indicate that higher proportions of halibut QS holders fish from their own vessels than is the case for sablefish QS holders. Sixty-six percent of halibut QS holders fished on their own vessel; 33 percent fished on someone else's vessel; and 1 percent fished on their own vessel and on someone else's. In contrast, 56 percent of sablefish QS holders fished on their own vessels, while 40 percent fished on someone else's, and 4 percent fished on their own vessel and on someone else's (Table 3.3).

Table 3.3 QS holders who fished from their own or another's vessel in 2009

	Halibut	Sablefish
Fished on own vessel	66%	56%
Fished on someone else's vessel	33%	40%
Both	1%	4%
Total responses	375	218

The propensity to fish from one's own vessel varies across vessel size class and by magnitude of QS holdings (Figure 3.4). For example, nearly 70 percent of the halibut B-class and C-class QS holders with QS holdings in excess of 20,000 lbs fished from their own vessels. In contrast, nearly 70 percent of the D-class with large QS holdings fished from someone else's vessel. In general, small QS holders had a higher tendency to fish aboard someone else's vessel.

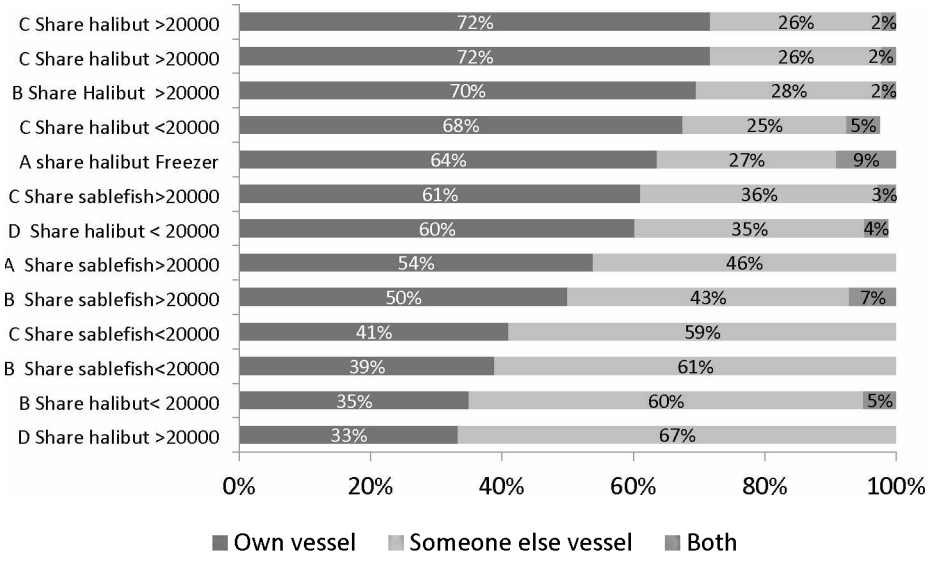

Figure 3.4. Percent of QS holders who fished from their own or other vessels in 2009.

Question 2: What percent of sablefish QS holders fished from their own or another's vessel.

Question 2 presented respondents with a list of the halibut and sablefish management areas off Alaska and asked them to identify areas they fished for halibut and sablefish during 2009. Many of the IFQ QS holders selected several areas in response to this question and the first response was selected. A plurality (49 percent) of the halibut QS respondents reported fishing in IPHC Area 3A, 34 percent fished in Area 2C, 12 percent fished in Area 3B, and 5 percent fished in Areas 4A, 4B, 4C, or 4D.

In comparing the survey data with the number of landed halibut for 2009, we found very close similarities in the response and the actual landings for 2009 (NMFS, 2009). Area 2C and 3A had a slightly larger response rate which may be due to the strong interest in issues that are related to 2C (lower TAC and charter issues).

Question 2 asked the same question for the sablefish fishery. Forty-seven percent of respondents with sablefish QS fished in Area SO, 31 percent fished in Area Central Gulf, 10 percent fished in West Yakutat, and the remaining 12 percent fished in the Aleutian Islands, Bering Sea, or Western Gulf. Comparing the sablefish survey data with the 2009 numbers landed in these areas, we found slightly more respondents from Southeast Outside than the actual proportion of total catch recorded from Southeast Outside in 2009.

Question 3: Identify the number of crew onboard the vessel during the fishing season.

The third question asked respondents to identify the number of crew onboard the vessel during the fishing season. Crew size varies as a function of vessel size and a number of factors. Twenty-seven percent of halibut QS holders reported that they had three licensed crew on the vessel for the 2009 season, 26 percent reported having two licensed crew, and almost 20 percent reported having one crew member. Crew size in the sablefish fishery was larger.

The last category in Table 3.4 asked about numbers of licensed crew aboard halibut and sablefish boats when they were engaged in fishing trips for other species. This table shows that half the respondents stated there were three to four licensed crew onboard vessels and 21 percent responded they only had one licensed crew onboard (Table 3.4).

Table 3.4 Numbers of harvesting crewmembers on trips that targeted halibut, sablefish, and other species in 2009.

Licensed Crew	Halibut	Sablefish	Other Target Species
1	19.6%	13.6%	20.5%
2	26.1%	20.9%	11.5%
3	27.3%	27.2%	25.6%
4	16%	24.6%	25.4%
5	8.9%	10.5%	14.1%
6	1.8%	2.1%	2.6%
8	0%	0.5%	
10	0.3%	0.5%	
Total responses	337	191	78

Another way to analyze this data is to compare the large halibut QS holders with the small QS holders (Figure 3.5). In this figure you can see that the total number of crew onboard for the 2009 season was higher for the large halibut QS holders with 28 percent having three crewmembers and 24 percent having four crewmembers.

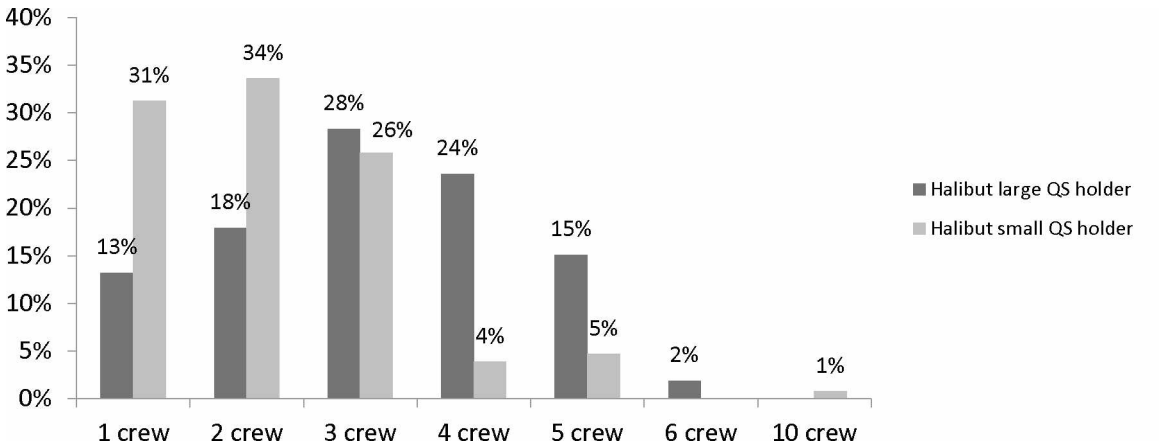

Figure 3.5. Number of harvesting crewmembers on trips that targeted halibut by QS holders' size.

The sablefish fishery was similar to the halibut fishery. Figure 3.6 shows in more detail the large sablefish QS holders with the smaller sablefish QS holders. Thirty-five percent of large sablefish QS holders 4 crewmembers compared to smaller QS holders who had 20 percent.

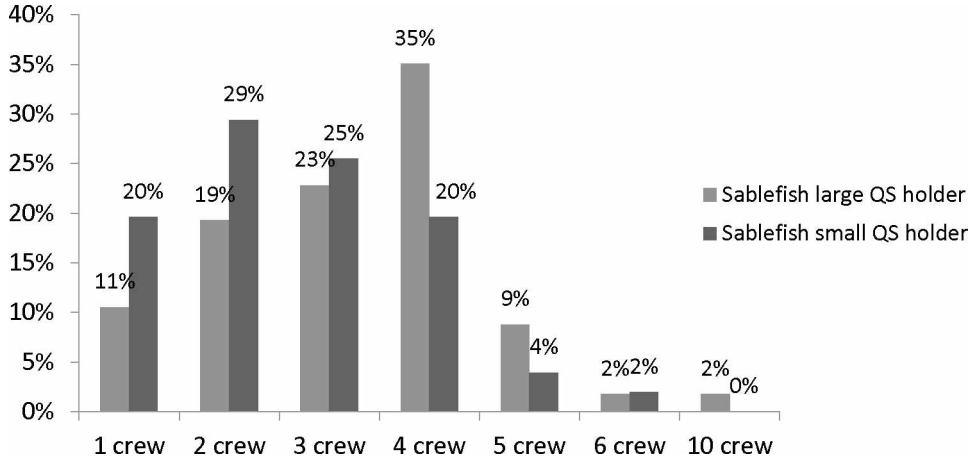

Figure 3.6. Number of licensed harvesting crewmembers on trips that targeted sablefish by QS holders' size.

Question 4: Number of crew who fished the entire halibut season by size of QS holdings.

The fourth question was asked to better understand the turnover of crewmembers each season. The sablefish fishery had a higher percentage of keeping four and five crewmembers all season than did halibut holders. Halibut and sablefish crew retention is the same on boats with two and three crew. Halibut vessels with a single crewman tended to retain that crewman for the entire season (except when fishing for other species).

Table 3.5 Number of licensed harvest crew who fished the entire season

Number of crew	Halibut	Sablefish	Other Species
1	23.3%	13.7%	27.6%
2	27.0%	26.4%	22.4%
3	23.3%	23.1%	18.4%
4	15.0%	21.4%	19.7%
5	8.7%	12.1%	11.8%
6	2.0%	2.7%	0.0%
7	0.3%	0.0%	0.0%
10	0.3%	0.5%	0.0%
Total responses	300	182	76

In looking at the number of crewmembers kept all season by size of QS holder, you get a clearer picture of the distribution of the crew for the fishery season (Figure 3.7). The number of crew that fished the entire season was higher in larger crews for larger halibut QS holders. Smaller QS holders had a smaller number of crew that fished the entire season. For halibut, 23 percent of respondents indicated that the entire crew of four stayed the whole season and 13 percent of vessels were fished by 5 crewmembers.

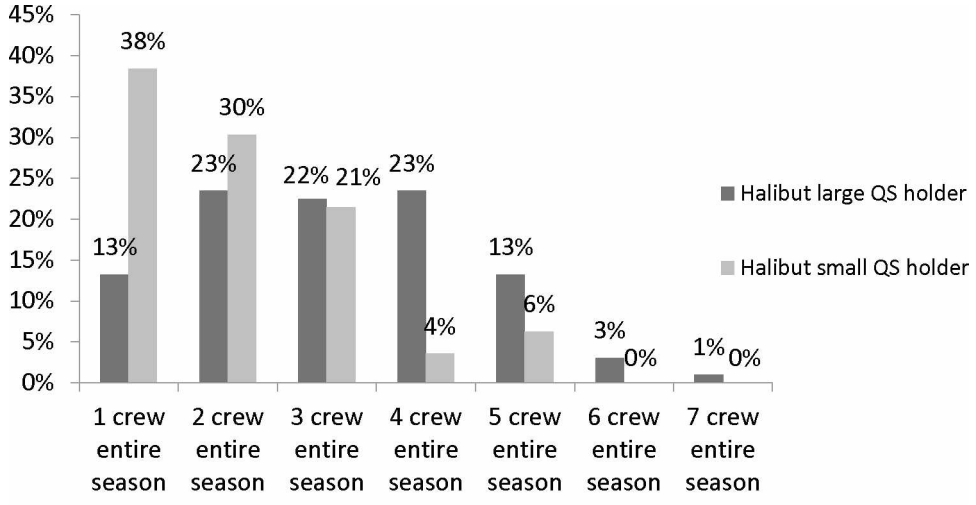

Figure 3.7. Number of licensed harvest crew who fished the entire halibut season by size of QS holdings.

Sablefish was similar to halibut in a comparison of larger QS holders with smaller QS holders. For sablefish large QS holders, 27 percent kept four crewmembers all season. Smaller QS holders were more likely to keep much smaller crews.

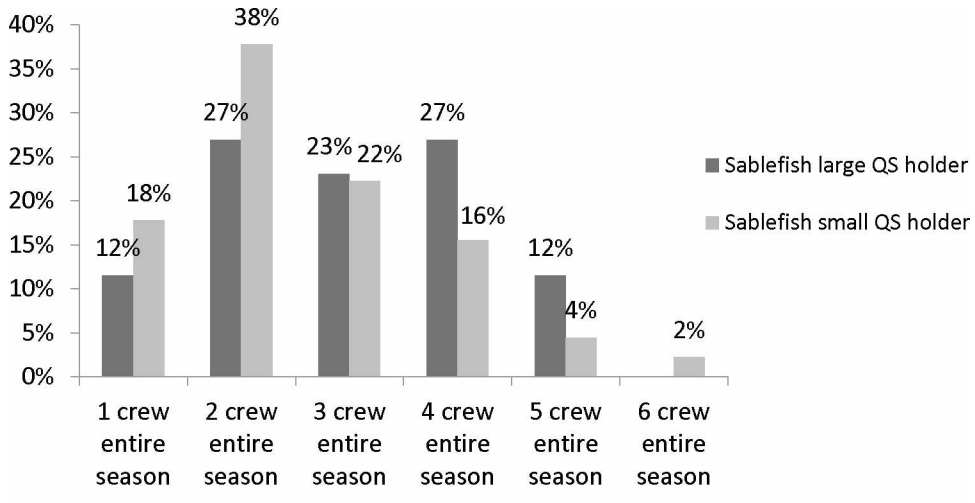

Figure 3.8. Number of licensed harvest crew who fished the entire sablefish season by size of QS holdings.

Question 5: How many quota share holders (not counting yourself) fished (or had a hired master fish) their quota shares on your vessel.

Question 5 was designed to elicit information on the number of QS holders on a vessel during a trip. The response shows similar numbers between halibut and sablefish QS holders that would fish on their vessel. Sablefish vessels had a larger percentage of 3 and 4 QS holders while halibut vessels had a higher percentage of 2 and 5 QS holders (Table 3.6).

Table 3.6 Number of QS holders besides the respondent who fished their QS aboard the respondent's vessel.

QS Holders	Halibut	Sablefish
1	37.7%	40.2%
2	24.7%	18.9%
3	15.2%	18.1%
4	6.7%	12.6%
5	10.3%	7.1%
6	3.1%	1.6%
7	0.9%	1.6%
8	0.4%	0.0%
9	0.4%	0.0%
Total responses	222	127

The survey included a series of questions about where their crew lived in relation to where the most of their fishing activity occurs.

Question 6: Where your crew lives in relation to where the majority of your halibut fishing activity took place.

The sixth question asks QS holders about where the most of their fishing activity for halibut took place. The answers from the survey were similar to vessel landings in Areas 3A and 2C. Similar to question 2 in the response rate by area and fishery, the halibut fishery in 3B had a slightly higher response rate.

Question 7: Identify each crew member's residency in relation to the halibut area identified.

Question 7 of the survey asked if the crew resided in the same area as the fishery or if they lived elsewhere in Alaska or were residents from out of state. Information about crewmembers on vessels in Alaska and where they fish in relation to where they live has always been difficult to measure. This question addresses this gap and gives an idea of where crew reside. Figure 3.9 shows the residence of the halibut crew that fished on the vessel. The first, second, and third crew were primarily from the local area while the fourth through the sixth crew were primarily from outside Alaska. This might suggest that the larger vessels with larger crew had a larger percentage that lived outside Alaska. This was an average of all data entered by the QS holder that shows which areas have crew that live near the fishing grounds. A small percentage (4%) answered that they had 7 to 10 crewmembers on- board over the season. These could be QS holders who advertise to fish their quota on available boats.

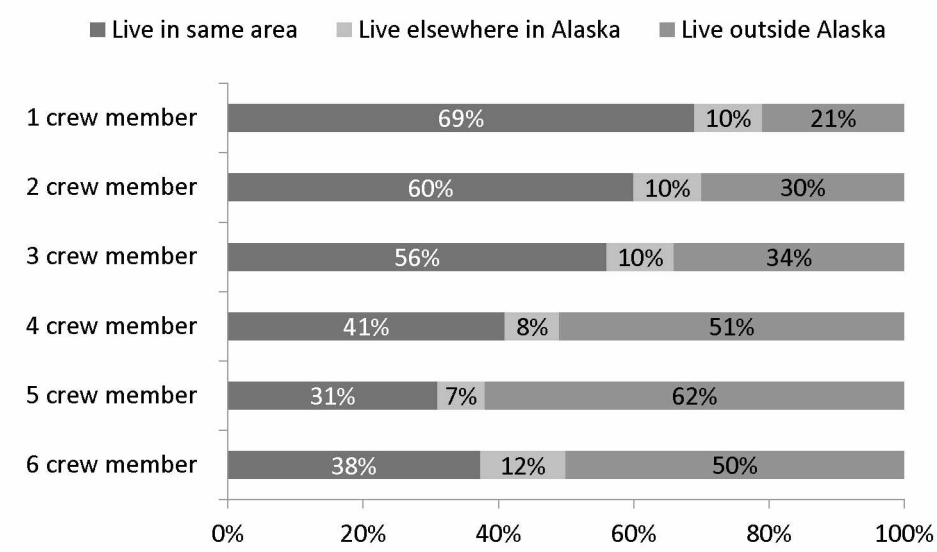

Figure 3.9. Residency of individual crew in the halibut fishery

The next section considers these same questions by area; it is very difficult to analyze the crewmembers' location in relation to where they fish. Crewmembers commercial fishing are unlike seafood processing workers who are paid a wage or salary. Instead, crew are paid a share of the harvest value. As a result, their employment does not generate payroll records that could be used as a basis for estimating employment in Alaska. One way to gain more information on the crew is through surveys such as this one. Many crewmembers live in Alaska and in the same community from which they fish, some live in other towns around Alaska, and some live outside of Alaska and come each year to Alaska to crew on vessels.

This question sought to determine where crew lived in relation to where most of their fishing activity took place. Figure 3.10 indicates that a plurality of crew that fish in areas 3B (Sandpoint) were not Alaska residents. In contrast, most of crewmembers aboard vessels that fished in areas 2C (Southeast Alaska) and 3A (Kodiak to Yakutat) were local residents.

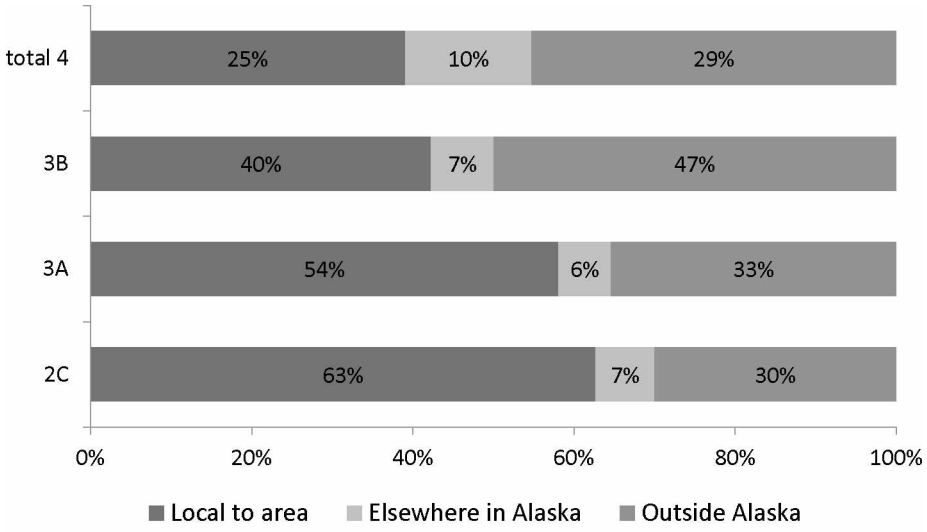

Figure 3.10. Residencies of crewmembers who fished for halibut by area in 2009 (Average response from QS holder of where crew lived

Question 8: Where your crew lives in relation to where the majority of your sablefish fishing activity took place.

The eighth question asked respondents to identify where the majority of their fishing activity occurred in 2009. Most QS holders fished in Southeast Outside and Central Gulf which is similar to the IFQ allocations and landings (NOAA Fisheries 2009). The response rate was slightly higher in Southeast Outside and Western Gulf.

Question 9: Identify each crew member's residency in relation to the sablefish area identified.

The ninth question sought additional information about the relationship between areas fished and the residence of crewmembers for the sablefish fishery. Respondents were told that these two questions seek to determine where crew live in relation to where most of your sablefish fishing activity took place in 2009. Where the sablefish crewmembers live in relation to where they fish is also difficult to measure. Many of the crewmembers live in Alaska and in the same community they fish, some live in other towns around Alaska, and some live outside of Alaska and come each year to crew on vessels. The residence patterns of the sablefish crew are similar to those of halibut crew. The first and second crewmembers were most frequently from the local area; the fourth through sixth crewmembers were typically from outside the state. This again suggests that most of the larger vessels crew lived outside Alaska.

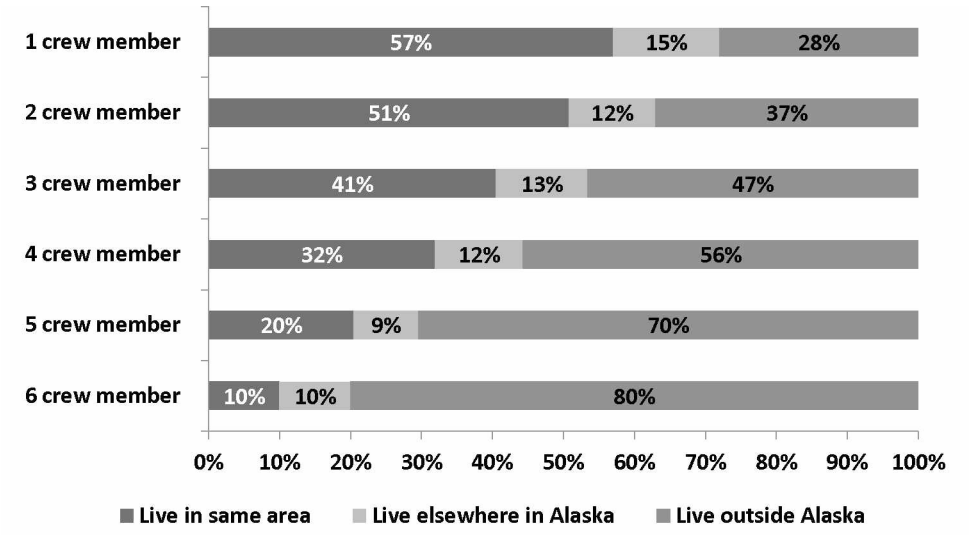

Figure 3.11. Residency of individual crew in the sablefish fishery (Average response from QS holder of where crew lived)

A large percentage of respondents who fished sablefish in 2009 lived outside of Alaska except Southeast Outside. Figure 3.12 shows that the Southeast Outside (SO) region had the highest percentage of residents: 75 percent lived in Southeast Alaska, 5 percent lived elsewhere in Alaska, and 20 percent lived outside of Alaska. The Aleutian Islands (AI) region had the largest proportion of respondents that lived outside Alaska; 71 percent; where 6 percent lived in the Aleutian Islands region and 24 percent lived elsewhere in Alaska.

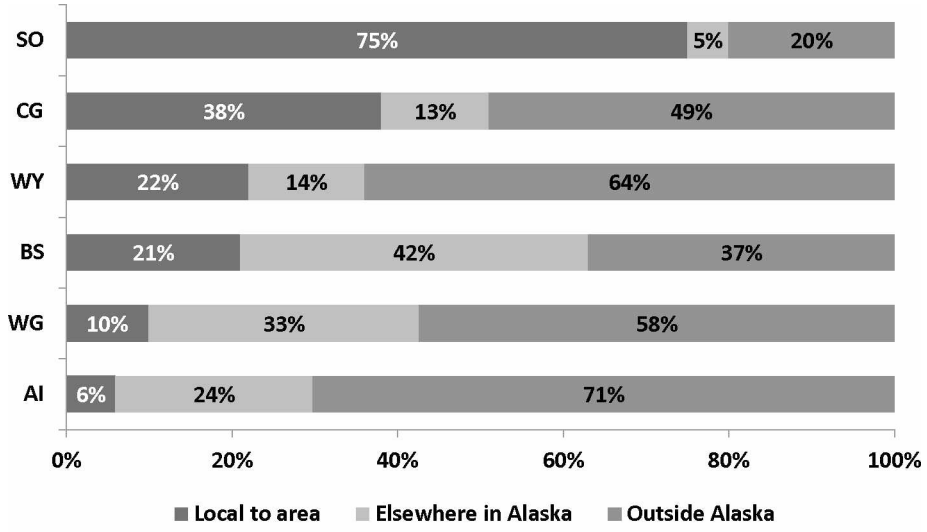

Figure 3.12. Areas where respondents fished for sablefish in 2009

The next figure represents patterns of crew hiring in relation to permit categories. For smaller C and D QS holders, crew are 7 or 8 times more likely to live in the area where they fish. For C and D large QS holders, crews are twice as likely to live in same region where they fish.

For halibut A and B shares, the crew is split evenly between living in the same location and living outside Alaska.

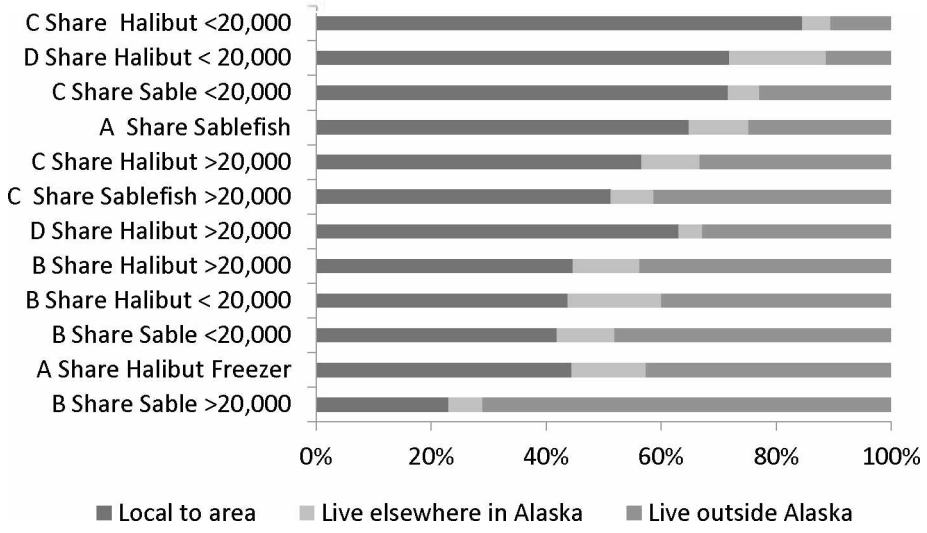

Figure 3.13. Crew residency in relation to vessel class and QS holdings in 2009

QS holdings of less than 20,000 lbs are denoted "small"; QS holdings of more than 20,000 lbs are denoted "large".

In general, larger QS holders had a larger percentage of crew living outside Alaska. This table looks at the average of data entered by the respondents by area and QS holdings. Over 71 percent of the sablefish B

share QS holders with over 20,000 lbs of QS live outside Alaska; 23.8 percent of the large QS holders live in the same regions where they fish and 5.9 percent live elsewhere in Alaska. Crew on larger boats that fish in remote fisheries often reside outside Alaska.

Question 10: Has it gotten easier or harder to hire qualified crew.

Question ten was designed to determine if the hiring of crew has gotten more difficult. Question 10 asked "Over the past 10 years, has it gotten easier or harder to hire qualified crew?" Some fishermen believe this is a problem but most think that there has not been a significant change.

Table 3.7 Difficulty of hiring qualified crew.

	Halibut	Sablefish
Much easier	13.4%	17.8%
Somewhat easier	17.9%	16.2%
No change	48.7%	47.1%
Somewhat harder	17.0%	14.7%
Much harder	3.0%	4.2%
Total responses	335	191

For both the halibut and sablefish fisheries, close to 50 percent of respondents stated there was not a problem in hiring crews. As the fishery has consolidated over the past 15 years, the crew has become more specialized and more experienced. Larger vessels have fewer problems keeping crew from year to year.

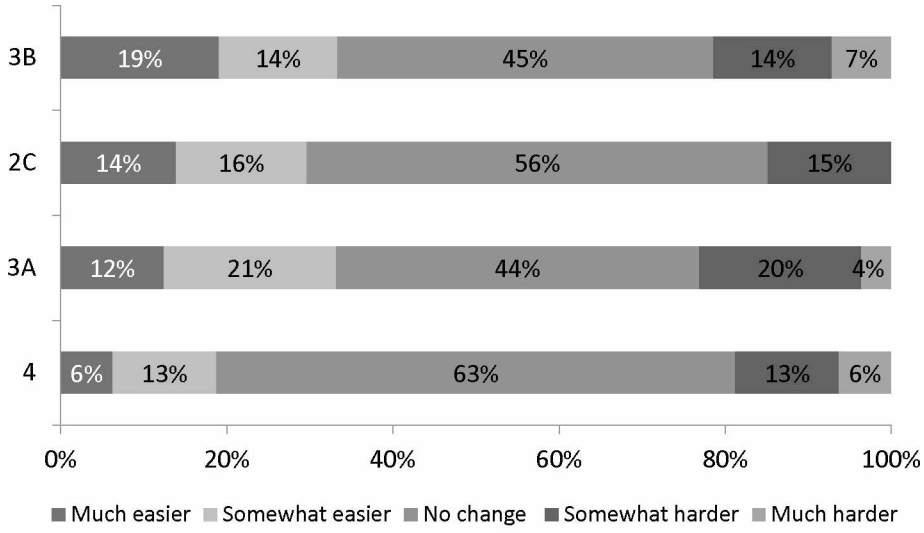

Figure 3.14. Difficult hiring quality crew for halibut fishery

By area, it is slightly easier to hire crew for halibut in Southeast Alaska and Kodiak compared with sparsely population, long distance and extreme weather of the Aleutian Islands and Bering Sea. The sablefish

fishery also has some difficulty finding crew in the Aleutian Islands, Bering Sea, and West Yakutat, with less of a problem in Southeast Outside, Western Gulf, and the Central Gulf of Alaska.

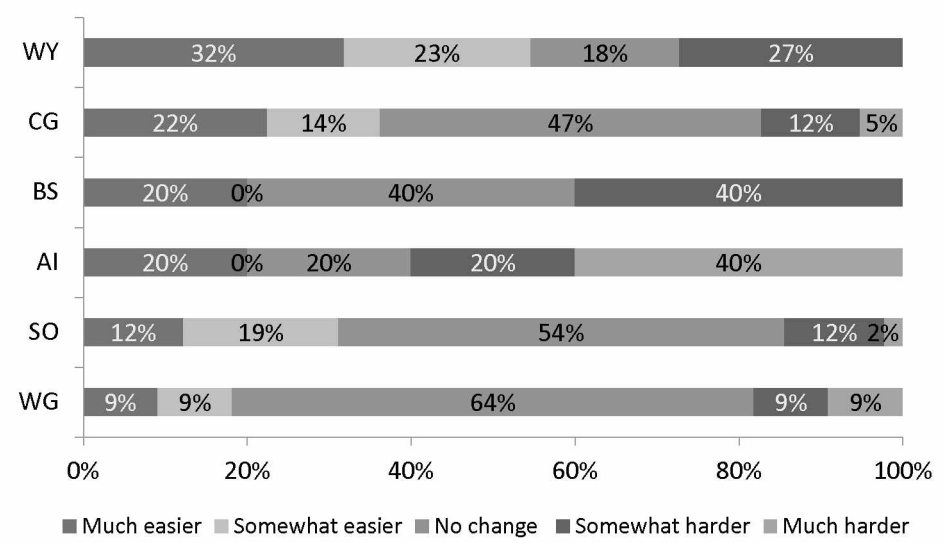

Figure 3.15. Difficult hiring quality crew for sablefish fishery.

The third section of the questionnaire asked: "In which community did you purchase most of your crew and vessel supplies for each target fishery?" Respondents replied they purchased their supplies in Alaska's larger coastal cities. Home ports such as Kodiak, Petersburg, and Sitka offer more supplies than merely for their home fleet vessels. This is also true to a smaller extent in Cordova, Dutch Harbor, Hoonah, and Juneau. For the sablefish fishery, Dutch Harbor and Petersburg are key suppliers for fishing supplies. Other important supply ports include Homer, Juneau, and Kodiak.

Question 11: List the port you operated out of most often while targeting.

This question aims to identify the ports out of which vessels operated during the IFQ season. Question 11 asked for information about the port respondents operated out of most often while targeting halibut and sablefish. The results are presented in Table 3.8.

Table 3.8 Home ports and principal supply ports used by respondents

	Halibut Home port	Sablefish Home port		Halibut Home port	Sablefish Home port
Adak	2	0	Ketchikan	5	3
Akutan	3	2	King Cove	3	2
Aleutian	1	1	Kodiak	38	16
Alitak	3	0	Pelican	4	0
Auke Bay	1	0	Petersburg	20	11
Cordova	13	9	Port Alexander	2	0

	Halibut Home port	Sablefish Home port		Halibut Home port	Sablefish Home port
Craig	5	3	Port Protection	1	0
Dutch Harbor	10	11	Sand Point	0	0
Elfin Cove	4	2	Seward	37	31
Excursion Inlet	1	3	Sitka	46	55
Gustavus	1	0	St. George Island	1	0
Haines	4	0	Unalaska	1	0
Homer	69	20	Valdez	5	5
Hoonah	7	2	Whittier	1	0
Juneau	15	9	Wrangell	3	0
Kenai	1	0	Yakutat	8	2

Home ports such as Homer and Kodiak ranked higher as home ports for halibut, and Sitka ranked higher for sablefish. Other ports like Seward, Petersburg, Juneau, and Cordova had both halibut and sablefish more equally selected.

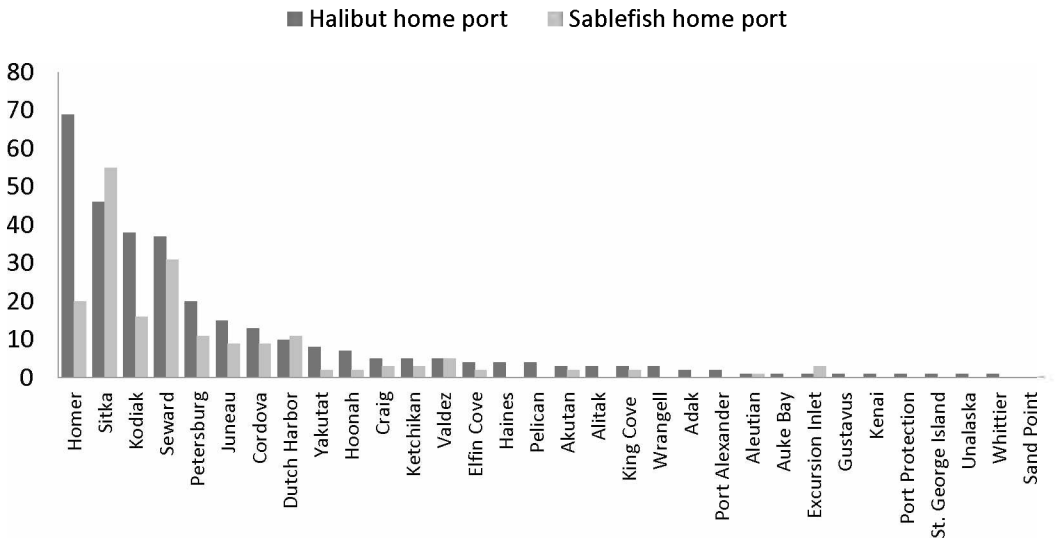

Figure 3.16. Home ports and principal supply ports used by respondents

The home ports that respondents selected all correspond to Alaska's top 10 ports listed in the annual Report to the Fleet, (The Pacific Halibut and Sablefish IFQ report for fishing year 2009). The top fishing ports

for halibut are Homer and Kodiak, and sablefish top ports are Seward and Sitka.

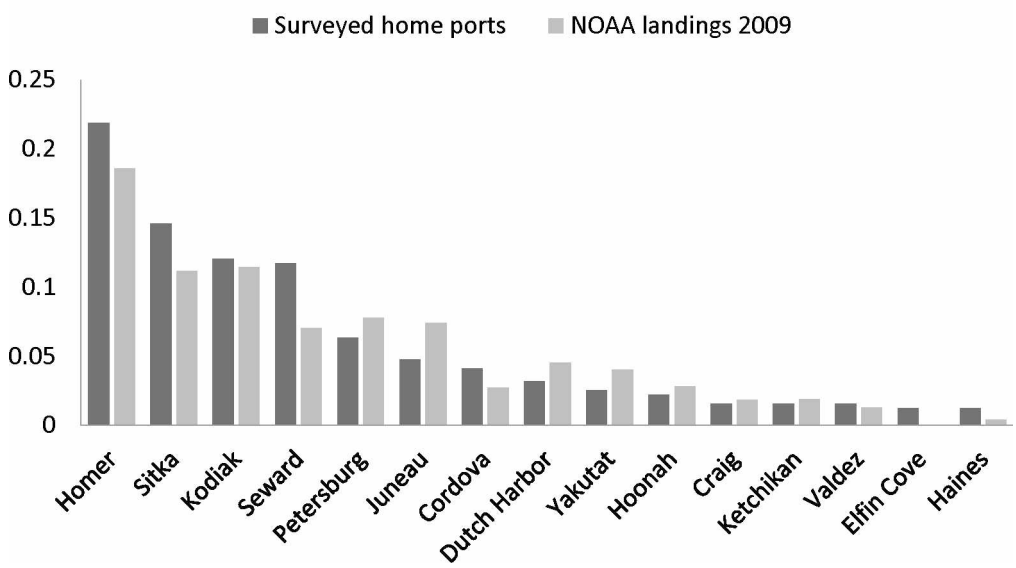

Figure 3.17. Compares surveyed home ports and landings for halibut

Question 12: Which community did you purchase most of your crew and vessel supplies for each target fishery.

The question identifies where vessel operators purchased their supplies.

Table 3.9 Respondents community purchased their supplies for the season

	Halibut supply	Sablefish supply		Halibut supply	Sablefish supply
Adak	1	0	Ketchikan	5	4
Akutan	1	0	King Cove	5	1
Aleutian	1	1	Kodiak	47	16
Alitak	0	0	Pelican	0	0
Auke Bay	0	0	Petersburg	30	15
Cordova	14	7	Port Alexander	0	0
Craig	3	2	Port Protection	0	0
Dutch Harbor	15	18	Sand Point	0	0
Elfin Cove	3	1	Seward	20	21
Excursion Inlet	0	0	Sitka	53	53
Gustavus	0	0	St. George Island	0	0
Haines	3	0	Unalaska	1	0
Homer	58	22	Valdez	4	3
Hoonah	12	3	Whittier	0	0
Juneau	19	11	Wrangell	5	2
Kenai	2	0	Yakutat	2	0

Home ports such as Kodiak, Petersburg, and Sitka offer more supplies then just to their home fleet vessels. This is also true to a smaller extent in Cordova, Dutch Harbor, Hoonah, and Juneau. For the sablefish fishery Dutch Harbor and Petersburg are key suppliers; other important supply ports include Homer, Juneau, and Kodiak.

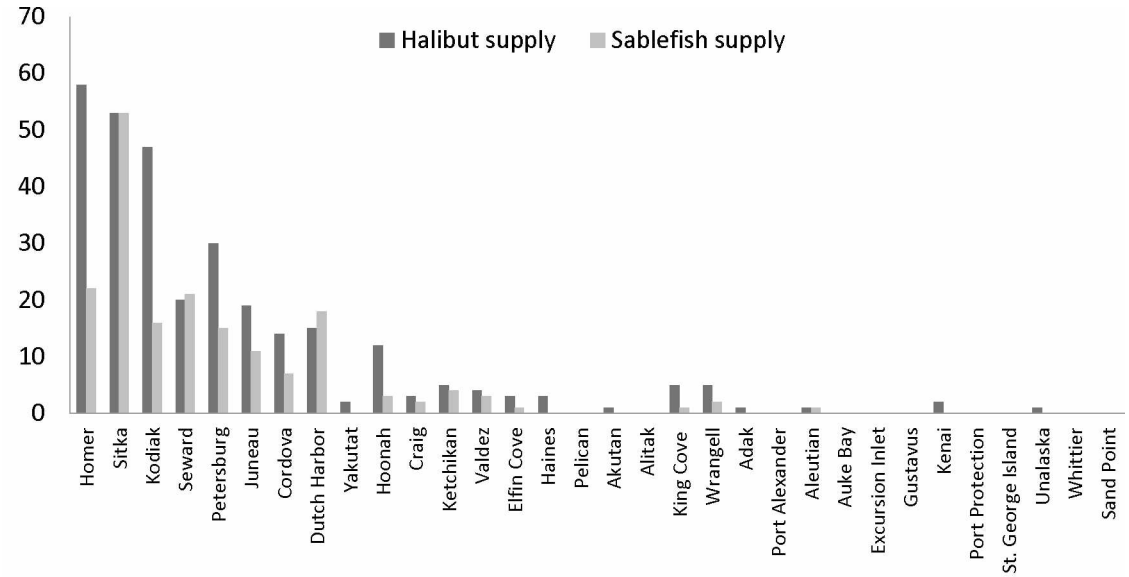

Figure 3.18. Supplies for halibut and sablefish results

The fourth section of the questionnaire surveys the percentage of gross revenues spent on operational costs. Question 13 was designed to better understand the operational costs of the respondents.

Question 13: What percentage of your gross revenues from IFQ fisheries was spent on the following operational costs.

Table 3. 10. Annual expenditures by vessels operating in the halibut IFQ fishery

	Fuel and Lube	Insurance	Bait	Fishing Gear	Vessel Maintenance
0-3%	19%	33%	35%	35%	19%
4-6%	35%	15%	24%	24%	35%
7-10%	24%	9%	11%	11%	24%
11-15%	11%	7%	4%	4%	11%
16-20%	4%	10%	6%	6%	4%
21% +	6%	19%	0%	0%	6%
Total responses	296	296	288	296	296

Table 3.10 Lists responses under five cost categories. The first category of fuel and lube is defined as the amount of fuel (diesel or gasoline) and all oils for the generator and engines that were used during the time this vessel was fishing in the 2009 season. The second category asks the 2009 vessel insurance expense. This relates the cost of insurance to total expenditures of the vessel. The third asks the cost in this season for bait. Bait is bought in bulk and put on the longline hooks before the fishing begins; fishermen commonly use

squid for sablefish and salmon or octopus for halibut. The fourth question asks the expenses for fishing gear (gloves, hooks, lines, etc.) for the year. The last question asks repair and maintenance expenses on the vessel for 2009 (including boat, electronic, and safety equipment repair and maintenance).

The expenses for the halibut are higher for vessel maintenance and fuel and lube. The percentage of operational costs spent on fuel for the halibut fishery was highest in the more remote area 4 with 34 percent of respondents selecting 16 percent or greater of their total costs. The lowest was 2C in which 60 percent of respondents selected that their cost was less than 6 percent of their operation costs. Area 3A closely followed 2C with 58 percent of respondents selecting that their cost was less than 6 percent of their operation costs.

This amount is less than the total expenditure that was recorded by another survey "Fall 2008 Alaska Commercial Fishermen and Tender Fuel Survey" completed by Sea Grant in the Fall of 2008. At the time of the survey (Fall 2008), the price for the fuel prices were relatively higher than when this survey was done February 2009. The results show that a price increase can have a significant effect on the fishery.

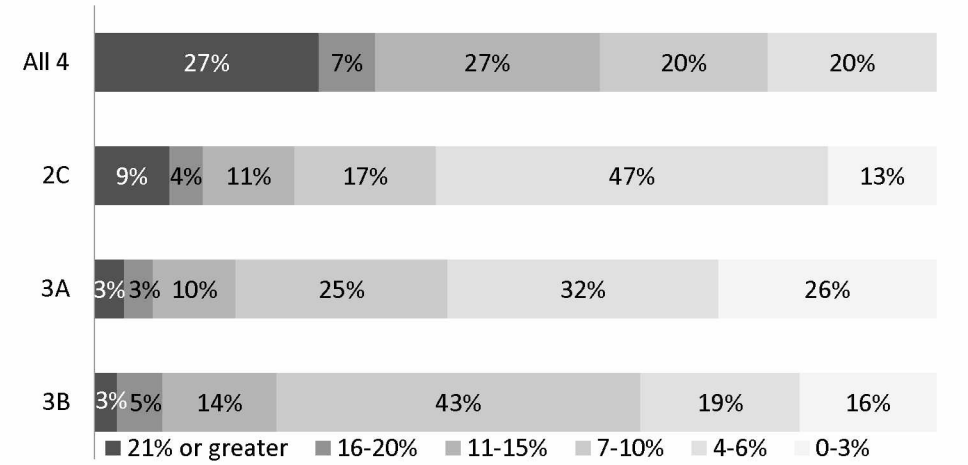

Figure 3.19. Regional variations in the relative share of fuel and lube costs as a component of annual expenditures for halibut IFQ boats in 2009.

Total operational cost for insurance for the halibut fishery was highest in area 4 with over 33 percent of respondents selecting 16 percent or greater of their total costs. The lowest was 3A in which 39 percent of respondents selected that their cost was less than 4-6 percent of their operation costs.

This analysis parallels the general insurance industry guidelines pertaining to commercial boats. Insurance costs derive from a number of factors that include age and type of boat and type of fishery. The biggest expense is the liability for the crew. As reflected in the answers received in the survey, the insurance for the crew that fishes in open water (Bering Sea) is going to pay a higher percentage for liability than a boat fishing on the Alaska's Inside Passage.

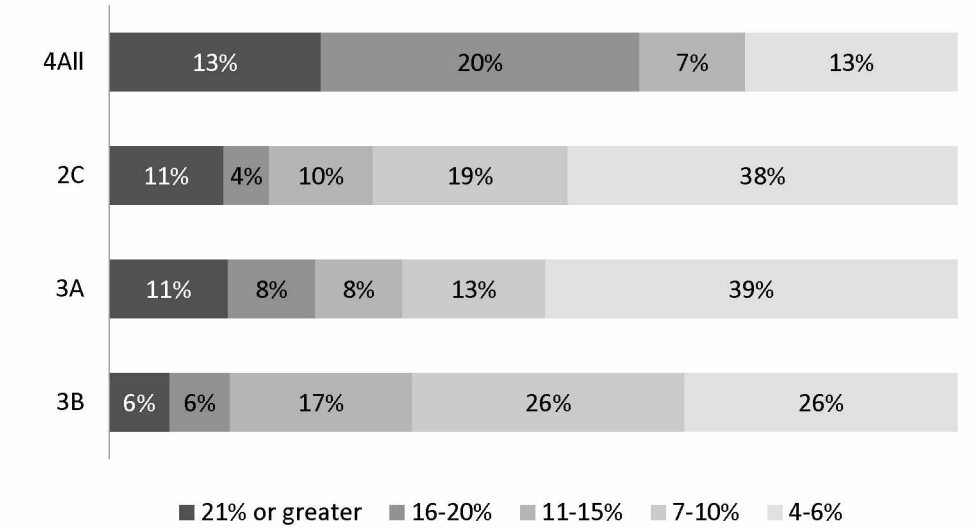

Figure 3.20. Regional variations in the relative share of insurance costs as a component of annual expenditures for halibut IFQ boats in 2009

Total operation cost for bait for the halibut fishery was a relatively small expense for all areas. The highest was in area 4 with over 15 percent of respondents selecting 21 percent or greater of their total costs. The lowest was 3A in which 87 percent of respondents selected that their cost was less than 6 percent of their operation costs.

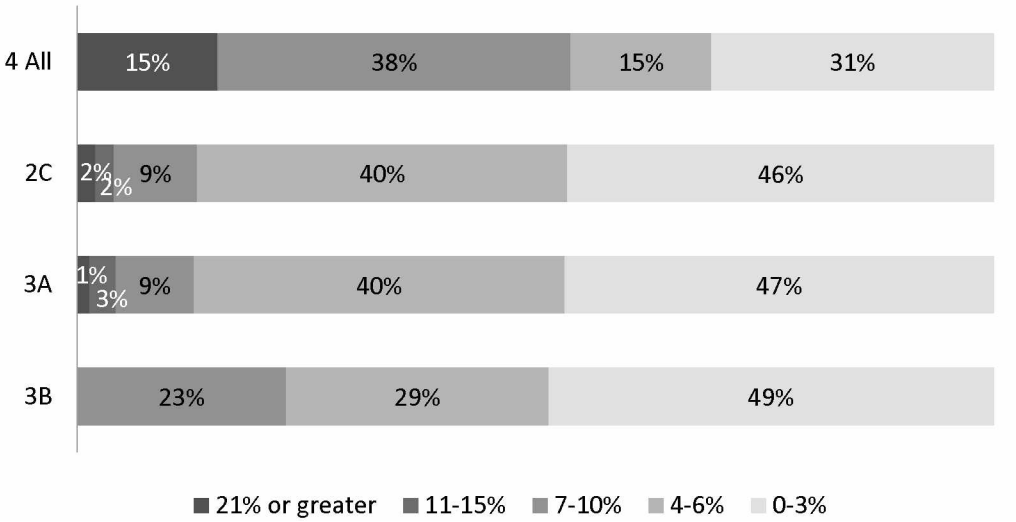

Figure 3.21. Regional variations in the relative share of bait costs as a component of annual expenditures for halibut IFQ boats in 2009

Total operation cost of fishing gear for the halibut fishery was again a relatively small expense for all areas. The highest was in area 4 with over 13 percent of respondents selecting 21 percent or greater of their

total costs. The lowest was 2C, 3B, and 3A in which 84–91 percent of respondents selected that their gear was less than 6 percent of their operation costs.

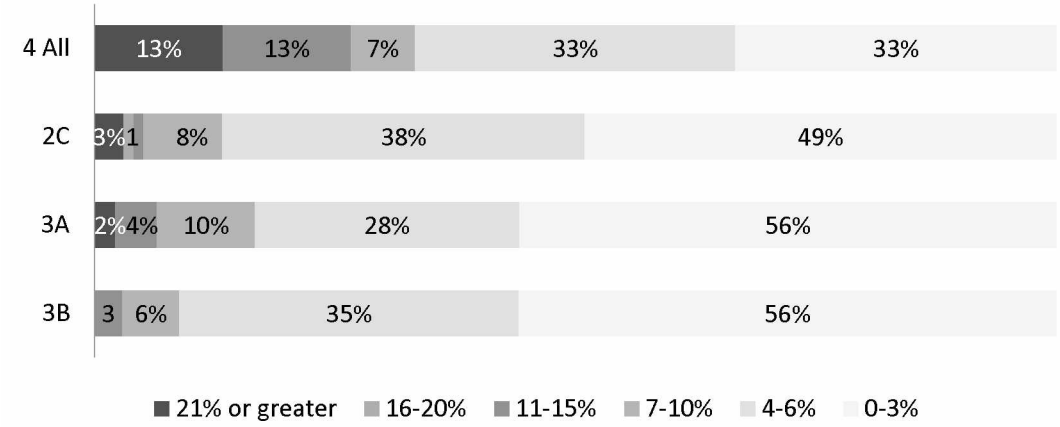

Figure 3.22. Regional variations in the relative share of fishing gear costs as a component of annual expenditures for halibut IFQ boats in 2009.

Total operation costs of vessel maintenance for the halibut fishery was highest in areas 3A at 17 percent and 3B with 16 percent of respondents selecting their total costs were 16 percent or greater. Area 4 held the highest range (16–20 percent) of their operation cost. Area 2C maintenance costs were lower with their operation cost expenditures less than 15 percent.

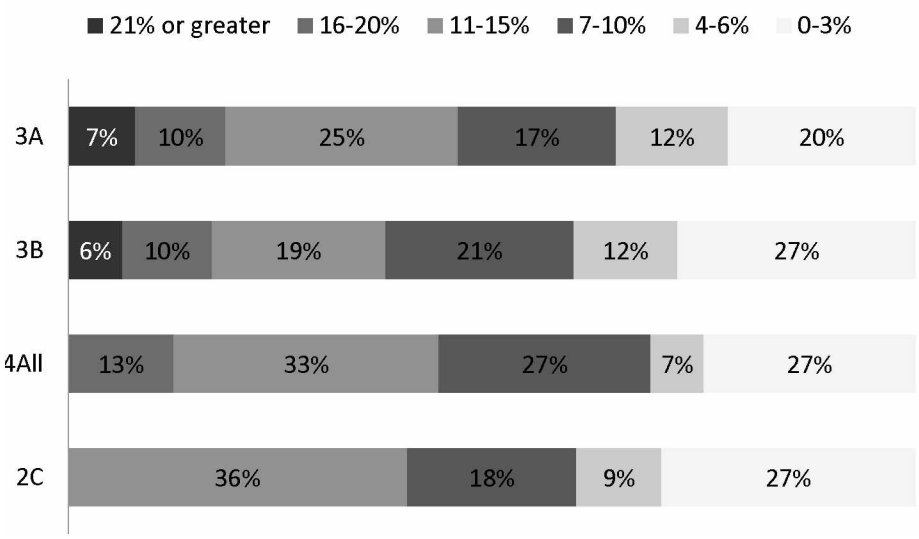

Figure 3.23. Regional variations in the relative share of vessel maintenance costs as a component of annual expenditures for halibut IFQ boats in 2009

For the sablefish fishery, the percentage of the gross revenues spent on operational costs such as fuel, lube, insurance, and fishing gear are mostly under 6 percent of the gross revenue with bait, and vessel maintenance between 7–15 percent. By area there is a higher percentage of expense on the purchase of bait and vessel maintenance.

Table 3. 11. Annual expenditures by vessels operating in the sablefish IFQ fishery

	Fuel Lube	Insurance	Bait	Fishing gear	Vessel Maintenance
0-3%	23%	35%	17%	33%	14%
4-6%	33%	18%	34%	21%	22%
7-10%	21%	8%	35%	12%	33%
11-15%	12%	8%	12%	4%	15%
16-20%	4%	8%	1%	7%	9%
21% +	7%	22%	1%	0%	8%
Total responses	182	170	212	182	172

The percentage of operational costs spent on fuel for the sablefish fishery was highest in the Aleutian Islands with over 60 percent of respondents selecting 16 percent or greater for their total costs. The lowest was Western Gulf in which 100 percent of respondents selected that their cost was less than 15 percent of their operation costs.

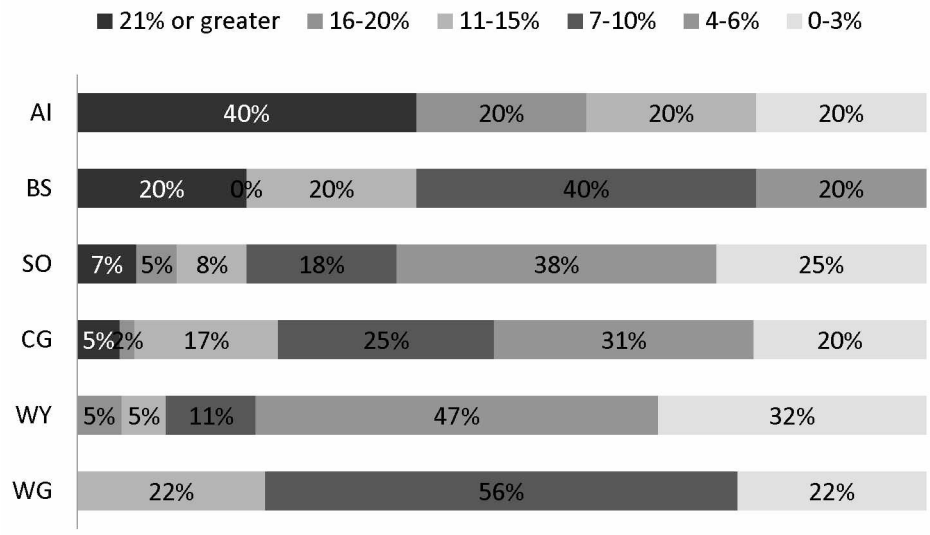

Figure 3. 24. Regional variations in the relative share of fuel and lube costs as a component of annual expenditures for sablefish IFQ boats in 2009

Total operational cost for insurance for the sablefish fishery was highest in the Bering Sea with over 80 percent of respondents selecting 16 percent or greater of their total costs. The lowest was Southeast Outside in which 68 percent of respondents selected that their costs were less than 6 percent of their operational costs.

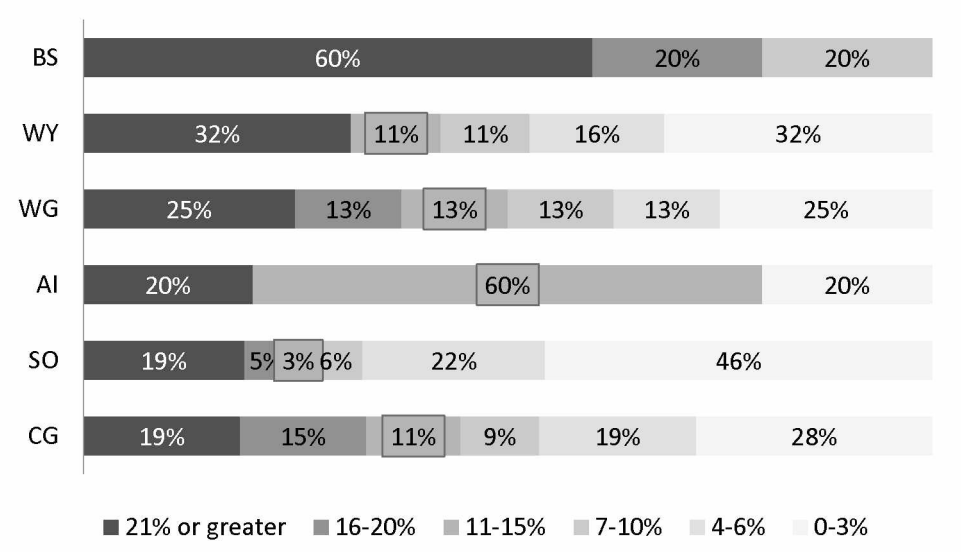

Figure 3.25. Regional variations in the relative share of insurance costs as a component of annual expenditures for sablefish IFQ boats in 2009

Total operational costs of bait for the sablefish fishery was a relatively small expense for all areas. The highest was in Bering Sea with over 20 percent of the respondents selecting 21 percent or greater of their total costs. The lowest was West Yakutat and Southeast Outside in which between 85 and 90 percent of the respondents selected that their bait was less than 6 percent of their operation costs.

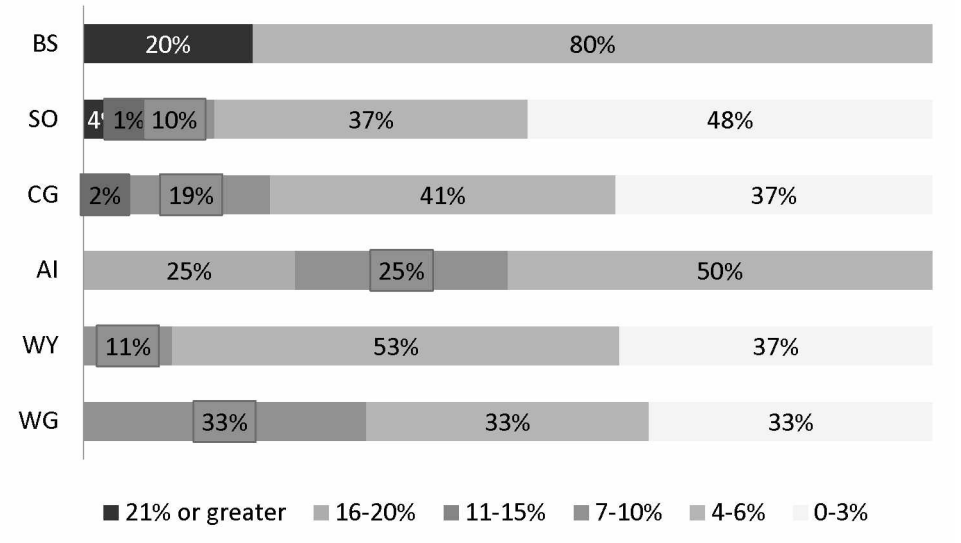

Figure 3.26. Regional variations in the relative share of bait costs as a component of annual expenditures for sablefish IFQ boats in 2009

Total operational costs of fishing gear for the sablefish fishery was the highest in the Bering Sea with over 20 percent of respondents selecting 21 percent or greater of their total costs. The lowest was West Yakutat in which 84 percent of the respondents selected that their cost was less than 6 percent of their operational costs.

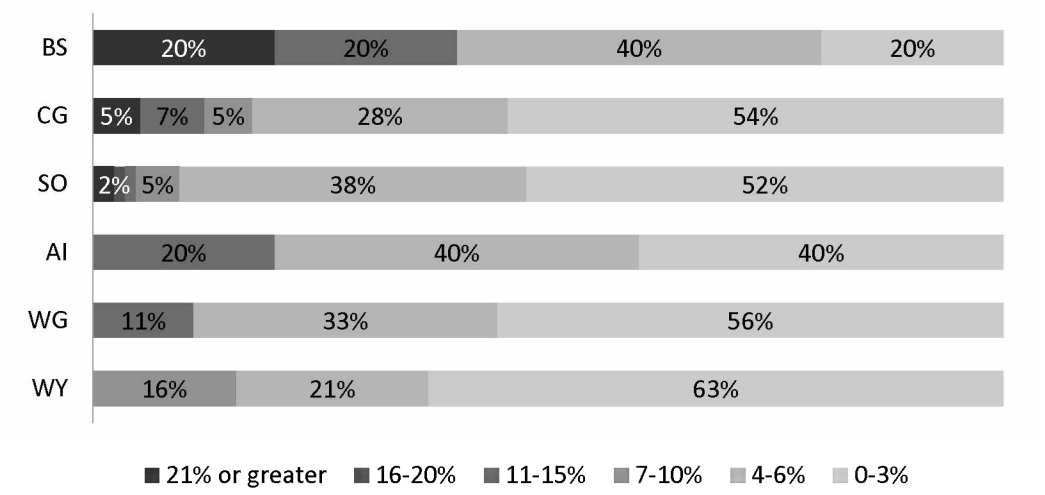

Figure 3.27. Regional variations in the relative share of fishing gear costs as a component of annual expenditures for sablefish IFQ boats in 2009

Total operation cost for vessel maintenance for the sablefish fishery had the highest percentage in the Bering Sea with 40 percent of respondents selecting 21 percent or greater of their total costs. West Yakutat with 48 percent, had the lowest range of 0–6 percent of their operation cost.

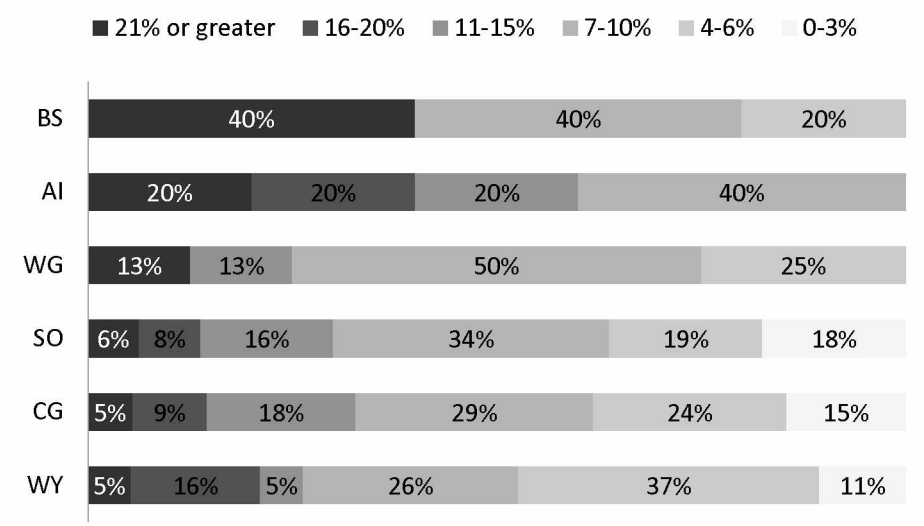

Figure 3.28. Regional variations in the relative share of vessel maintenance costs as a component of annual expenditures for sablefish IFQ boats in 2009

In comparing annual expenditures by vessel operation with different types of vessel class and QS holding, you can better understand the effects of fuel prices on each class of vessel and QS holder. The large

halibut quota holders for A share and B share had larger expenses for fuel than did the smaller quota holders. The large quota holders for sablefish were lower than small QS holders which might suggest that the vessels used for the large sablefish QS holders are much larger and might rate the fuel expense as a lower total percentage. It also might suggest that the larger vessels are more fuel efficient or get discounts with bulk fuel purchases.

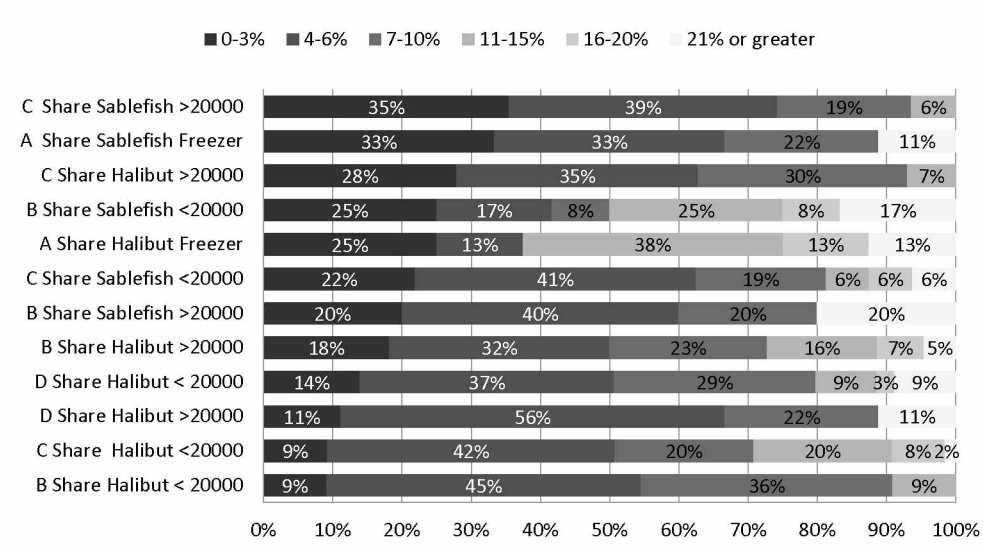

Figure 3.29. Regional variations in the relative share of fuel and lube costs as a component of annual expenditures for sablefish IFQ boats in 2009

Bait cost in comparison to the QS holders and vessel class shows a similar pattern of fluctuation between sizes and class. Bait costs were slightly higher in A shares for both fisheries but mostly similar across all classes.

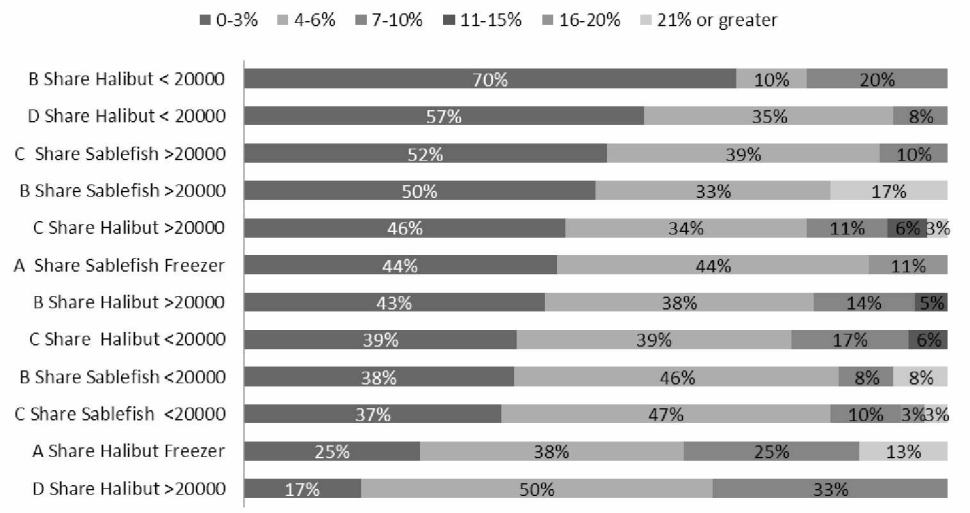

Figure 3.30. Regional variations in the relative share of bait costs as a component of annual expenditures for halibut and sablefish IFQ boats in 2009

Fishing gear costs were slightly higher in A shares for halibut but mostly similar across all classes.

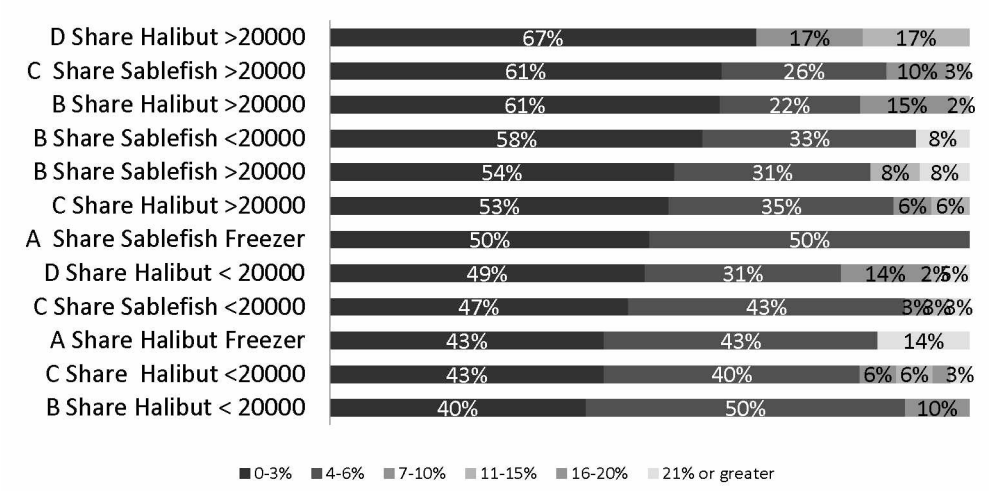

Figure 3.31. Regional variations in the relative share of fishing gear as a component of annual expenditures for halibut and sablefish IFQ boats in 2009.

Question 14: Roughly, what percentage of your 2009 gross revenues from IFQ fisheries was spent on the following operational costs.

The scope of this question includes the percentage of the gross revenues spent on crew share, captain share, and vessel share for the halibut IFQ fishery. Crew share is the percentage that the crewmember is paid from the revenue of the vessel. Captain share is the amount that the captain is paid. Vessel share is the percentage that the vessel is allocated for a particular fishing trip.

Table 3. 12 Crew share, Captain share, and Vessel share as percentages of 2009 gross revenues from participation in the halibut IFQ fishery

	Crew share	Captain share	Vessel share
0-9%	11%	24%	10%
10-19%	30%	29%	14%
20-29%	30%	17%	21%
30-39%	13%	14%	25%
40-49%	10%	7%	19%
50% +	6%	9%	12%
Total response	375	278	290

Gross revenues spent on vessel share, crew share, and captain share for the halibut and sablefish IFQ fisheries varied by area. For halibut, the Aleutian Islands and the Bering Sea QS holders paid a higher percentage for the vessel share. Sablefish A share and large sablefish QS holders had the largest percentage

selected to vessel share. For crew share, the larger halibut QS holders paid a higher amount to their crew than did larger sablefish holders. In general, the captains on the larger vessels paid a higher percentage to the crew than did captains on the smaller vessels. The smaller halibut vessels had the highest percentage of captain share. Crew expenses are more expensive in area 3B and area 4 with regard to the remote location.

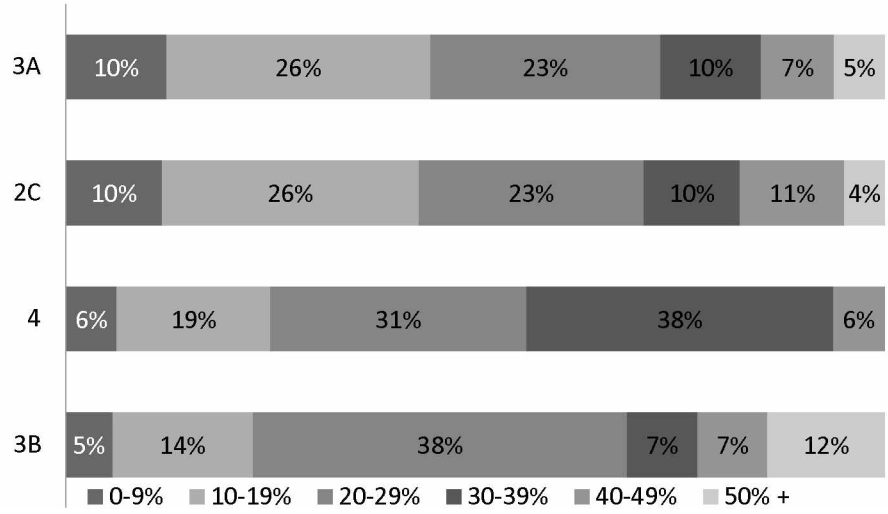

Figure 3.32. Regional variations in crew shares as percentages of annual gross revenues for halibut IFQ boats in 2009

Captain expenses are more expensive in area 4 with regard to the remote location.

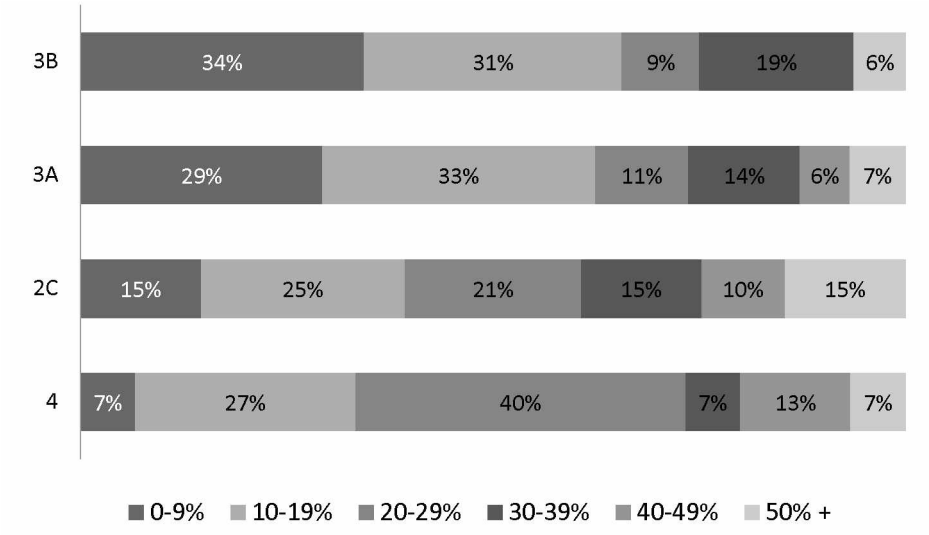

Figure 3.33. Regional variations in captain shares as percentages of annual gross revenues for halibut IFQ boats in 2009

Vessel expenses are more expensive in area 4 with regard to the remote location.

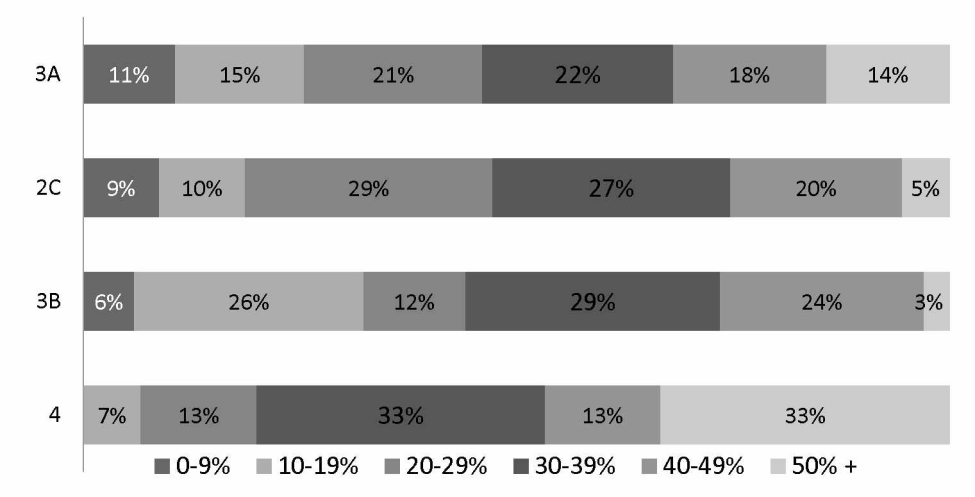

Figure 3.34. Regional variations in vessel shares as percentages of annual gross revenues for halibut IFQ boats in 2009

This section shows the percentage of the gross revenues spent on crew share, captain share, and vessel share for the sablefish IFQ fishery.

Table 3.13. Crew Share, Captain Share, and Vessel Share as percentages of 2009 gross revenues from participation in the sablefish IFQ fishery

	Crew share %	Captain share%	Vessel share %
0-9%	11%	22%	10%
10-19%	30%	28%	14%
20-29%	30%	9%	21%
30-39%	13%	6%	25%
40-49%	10%	5%	19%
50% +	6%	5%	12%
Total responses	375	218	290

Crew cost are more expensive in the Western Gulf with regard to the remote location.

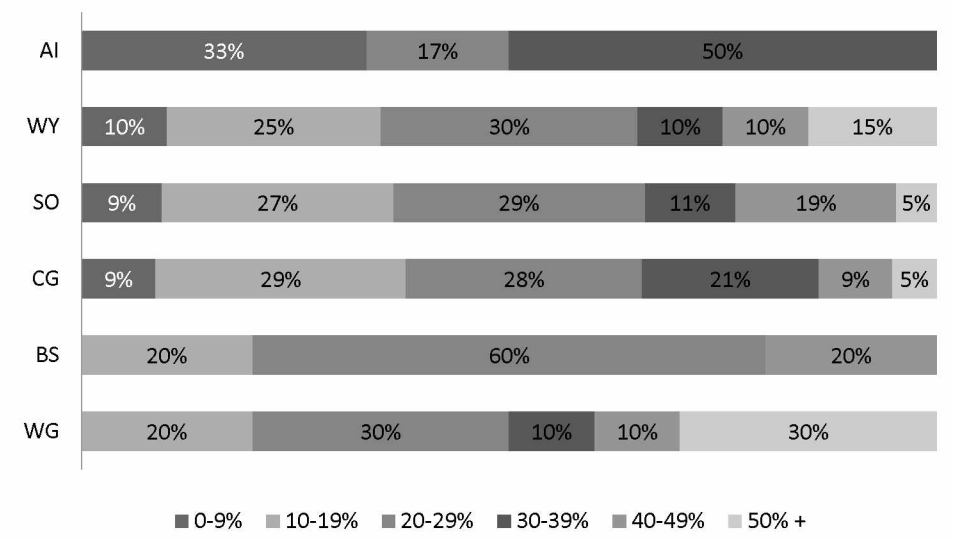

Figure 3.35. Regional variations in crew shares as percentages of annual gross revenues for sablefish IFQ boats in 2009.

Captain expenses are more expensive in the Western Gulf and Aleutian Islands with regard to the remote location.

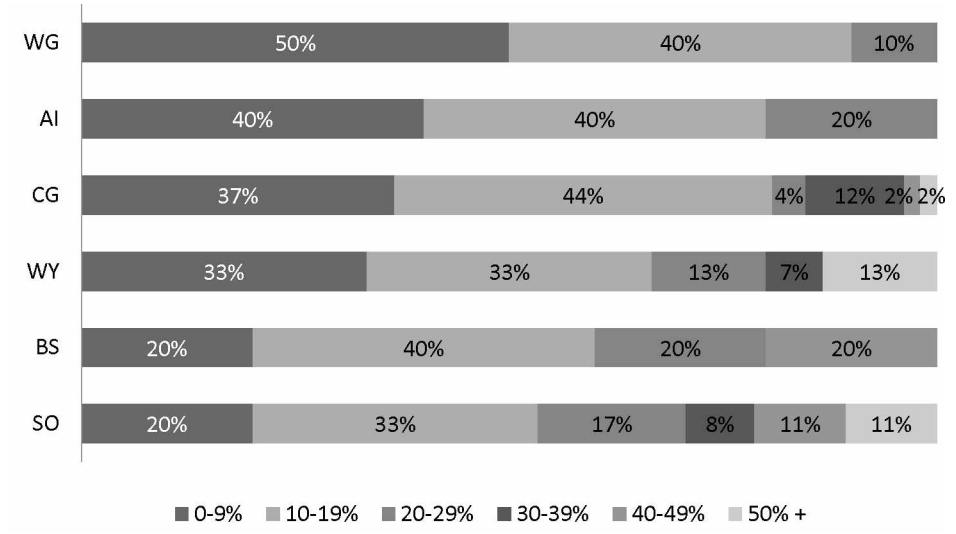

Figure 3.36. Regional variations in captain shares as percentages of annual gross revenues for sablefish IFQ boats in 2009

Vessel share for the sablefish fishery was higher in the Aleutian Islands followed closely by the Bering Sea with regard to their remote locations.

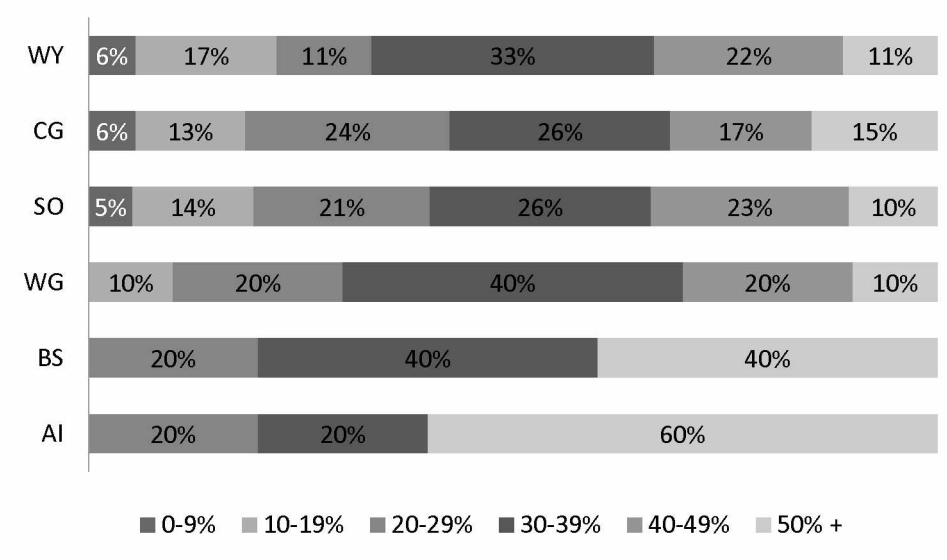

Figure 3.37. Regional variations in vessel shares as percentages of annual gross revenues for sablefish IFQ boats in 2009

The survey included a series of questions about how fuel prices affected operations during the 2009 season. Most halibut and sablefish QS holders answered that fuel prices did not disrupt their fisheries in the 2009 season. Area 3B showed a higher percentage of being affected by fuel prices for halibut. Question fifteen was designed to determine if the price of fuel disrupted the season.

Question 15: Did fuel prices disrupt your fishing for halibut

Did high fuel prices disrupt your fishing for halibut during 2009.

Table 3.14 Effects of fuel prices on halibut IFQ fishing operations in 2009.

	Affected by fuel prices	Not affected by fuel prices	Number of responses
2C	28%	72%	116
3A	27%	73%	169
3B	42%	58%	39
4	29%	71%	17
Overall	28%	72%	341

In the total response for halibut, almost three fourths responded that fuel prices did not disrupt their fisheries in the 2009 season. Response was similar across areas. However, 3B showed a different response of

42 percent of respondents stating that fuel prices did affect their 2009 fishing season. This response makes sense considering fuel prices in 2008 were the highest recorded price to date. There was a dramatic drop in price following 2008 which was a relief for QS holders.

Question 16. If you answered "Yes" how much did fuel prices disrupt your fishing for halibut.

In question sixteen the respondents were next asked about how fuel prices affected their 2009 fishing season for halibut, they ran the engine less, fished closer to delivery port, and made fewer trips. Viewing each question by area for halibut and sablefish, all areas selected, "ran the engine less" as the way most QS holders dealt with the increase in fuel prices.

For those respondents fishing for halibut "ran the engine less" received the most positive response followed by "I made fewer trips." Ran the engine less is presumed to mean the skipper lowered RPMs and not that they had the engine off more.

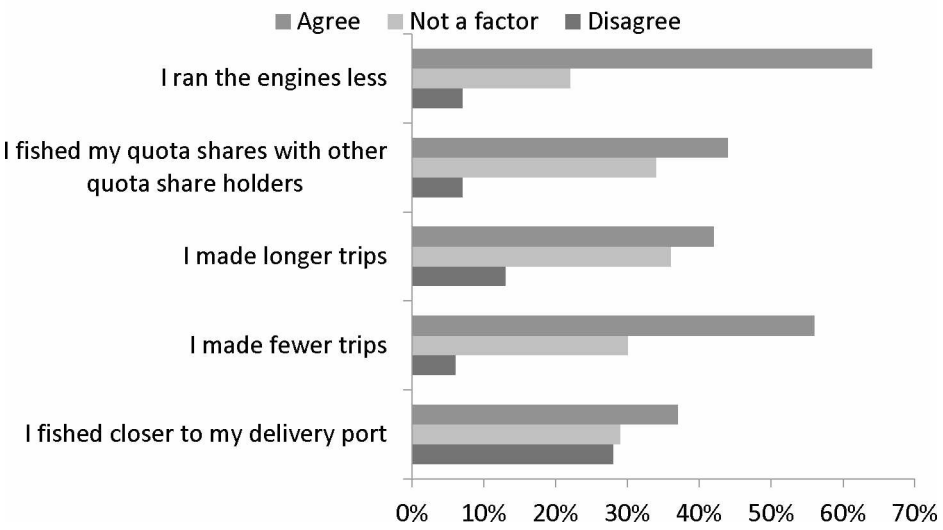

Figure 3.38. Effects of fuel prices on halibut IFQ boats in 2009

A more detailed examination of regional variation in the responses suggests some interesting results. Figure 3.39 represents a regional breakout of respondents who reported that "I fished closer to my delivery port." In general, all areas from the halibut fishermen responses agree with the statement of fishing closer to port. It seems that area 4 and area 3B favored fishing closer to their delivery point than do fishermen in Areas 2C and 3A.

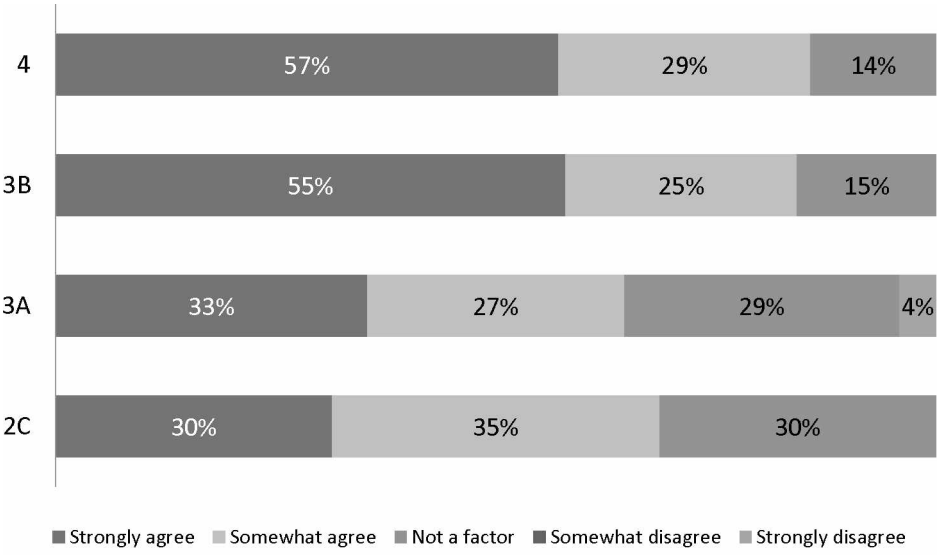

Figure 3. 39. Degree of agreement with statement that fuel price concerns led to halibut fishermen fishing closer to delivery port.

Most of the agreement of taking fewer trips was one of the ways to deal with fuel price concerns. Area 4 and area 2C had a higher response rate followed closely by Area 3A and Area 3B.

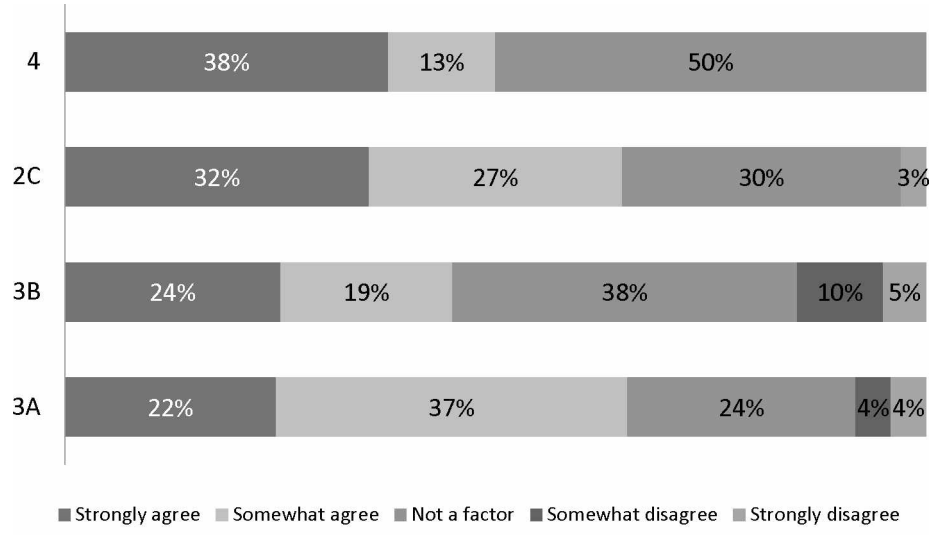

Figure 3. 40. Degree of agreement with statement that fuel price concerns led to halibut fishermen taking fewer trips.

Halibut QS holders dealt with fuel price concerns by making longer trips. The response for this was highest in Area 4 with 100 percent agreeing, followed by 3B. Half of the respondents from Area 3B and 2C agreed with this method.

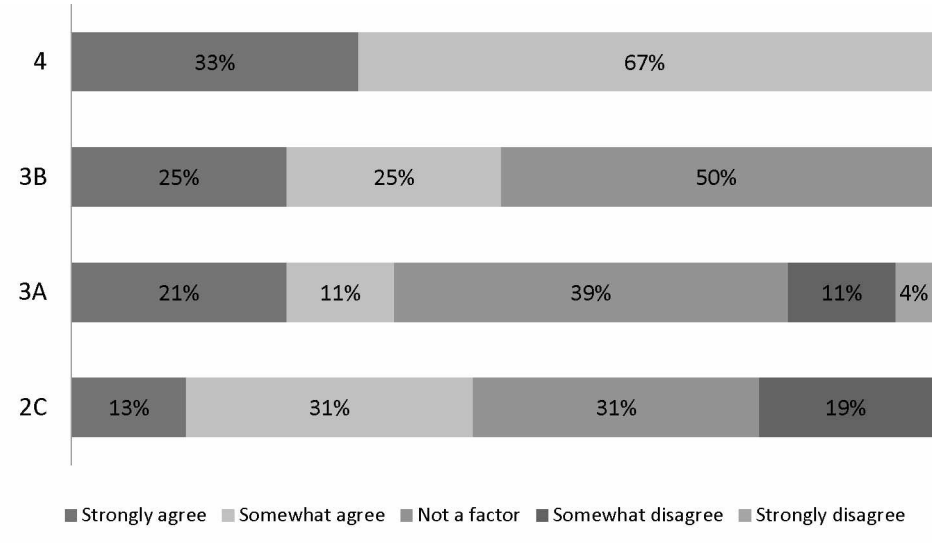

Figure 3. 41. Degree of agreement with statement that fuel price concerns led to halibut fishermen making longer trips

The fourth part of the question, I fished my QS with other QS holders. Many QS holders are fishing together with other QS holders; this seems to be a factor to conserve fuel. The response was similar between Areas 3B, 3A, and 2C with between 46 to 47 percent agreeing but this was much lower with 75 percent of Area 4 respondents selecting "not a factor."

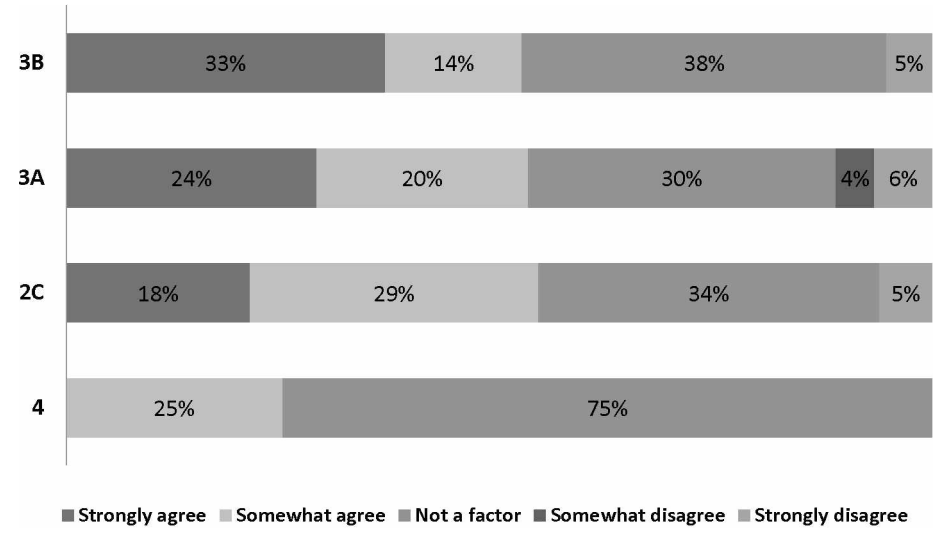

Figure 3. 42. Degree of agreement with statement that fuel price concerns led to halibut fishermen fishing quota shares with other QS holders

The final part of the question in this section was,"I ran the engine less." Many QS holders agreed with the method of running the vessel less. Many commercial fishing vessels can decrease fuel consumption

by reducing speed by just one or two knots and cut fuel consumption by 30 to 50 percent (Fisk, 2009). This has the strongest agreement with the more remote Area 4: Areas 3A, 2C, and 3B were slightly lower but in strong agreement on this question.

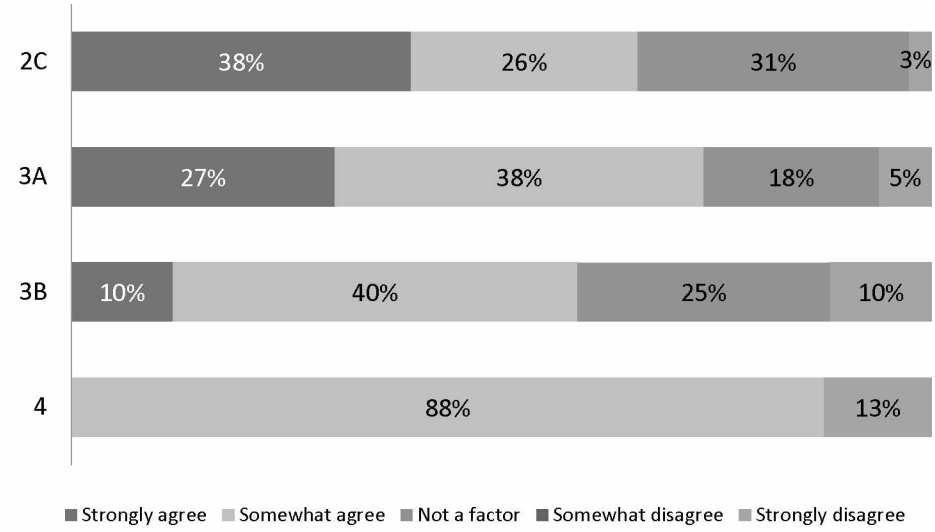

Figure 3.43. Degree of agreement with statement that fuel price concerns led to halibut fishermen to run the engine less

The following two questions were the same but asked about the sablefish fisheries. Question seventeen was designed to determine if the price of fuel disrupted the season.

Question 17: Did fuel prices disrupt your fishing for sablefish

Did high fuel prices disrupt your fishing for sablefish during 2009?

Table 3.15 Effects of fuel prices on sablefish IFQ fishing operations in 2009

	Affected by fuel prices	Not affected by fuel prices	Number of responses
SO	27%	83%	6
WY	50%	50%	4
CG	29%	71%	56
WG	19%	81%	93
AI	44%	56%	9
BS	21%	79%	19
Overall	23%	77%	187

Over three fourths responded that fuel prices did not disrupt their fisheries in the 2009 season. Response was similar across areas with the exception of West Yakutat, showing 50 percent of the respondents stating that fuel prices did affect their 2009 fishing season.

The next question was a continuation of the previous question as a follow up to the question.
In question eighteen the respondents were next asked about how fuel prices affected their 2009 fishing season for sablefish.

Question 18: If you answered "Yes" how much did fuel prices disrupt your fishing for sablefish.

If you answered "Yes" in question 17, please rate your level of agreement with the following statements. The most popular response from the sablefish fishermen was "I ran the engine less" followed by "I fished closer to my delivery port."

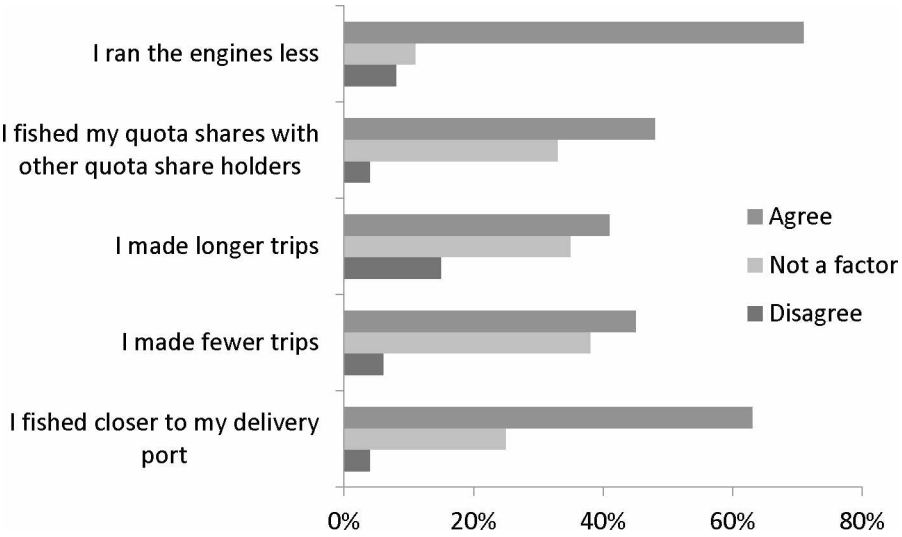

Figure 3. 44. Effects of fuel prices on sablefish IFQ fishing operations in 2009.

By area, Southeast Outside, and Bering Sea (followed by West Yakutat and Aleutian Islands) had a higher percentage of positive response for "fishing closer to delivery port." The sablefish fishermen's response agrees with the statement that fishing closer to port was an option for rising fuel costs. Aleutian Islands had 100 percent agreement followed by Bering Sea, Western Gulf, and West Yakutat, which all rated nearly 80 percent that fishing closer to their delivery point was a factor when there were concerns for fuel prices.

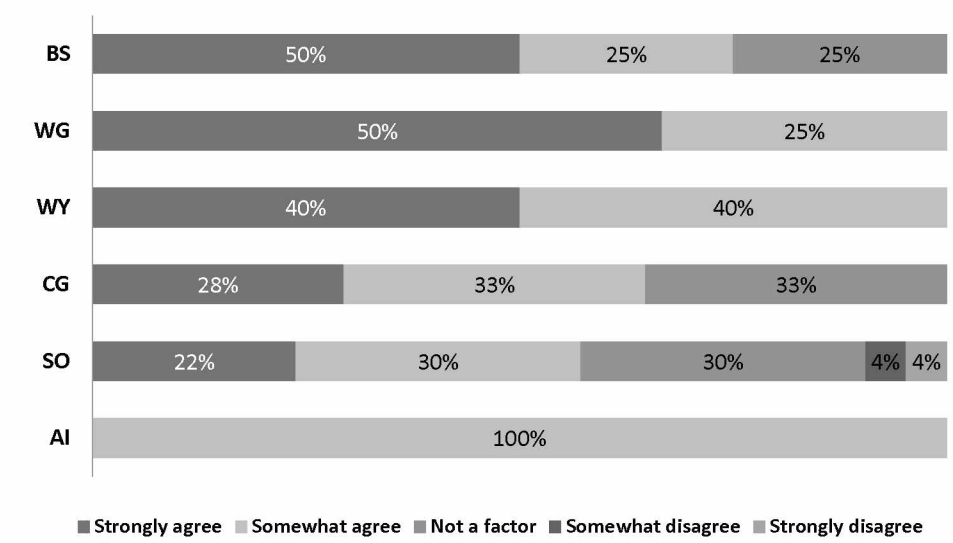

Figure 3. 45. Degree of agreement with the statement that fuel price concerns led to sablefish fishermen to fish closer to their delivery port.

In the next question (Figure 3.46) "I made fewer trips," Central Gulf had a higher percentage that strongly agreed compared to the other respondents. Sablefish QS holders listed taking fewer trips as another way to deal with the fuel price. West Yakutat had a higher response rate at 60 percent. Bering Sea selected "not a factor," which may be attributed to being an area where trips were taken once or twice a year due to their remoteness.

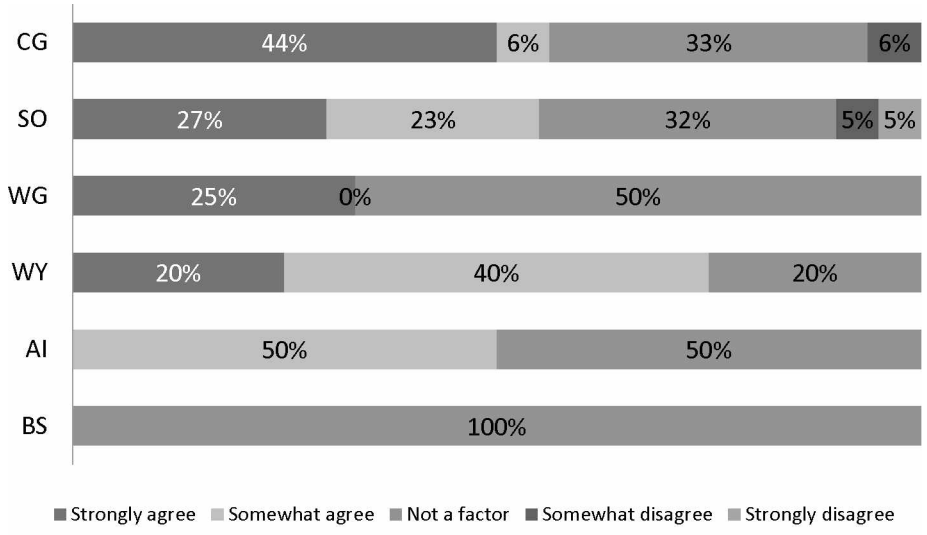

Figure 3. 46. Degree of agreement with the statement that fuel prices concerns led to sablefish fishermen taking fewer trips

The third question "I made longer trips" was highest in Western Gulf which may have been easier to combine two smaller trips into one longer trip to save fuel.

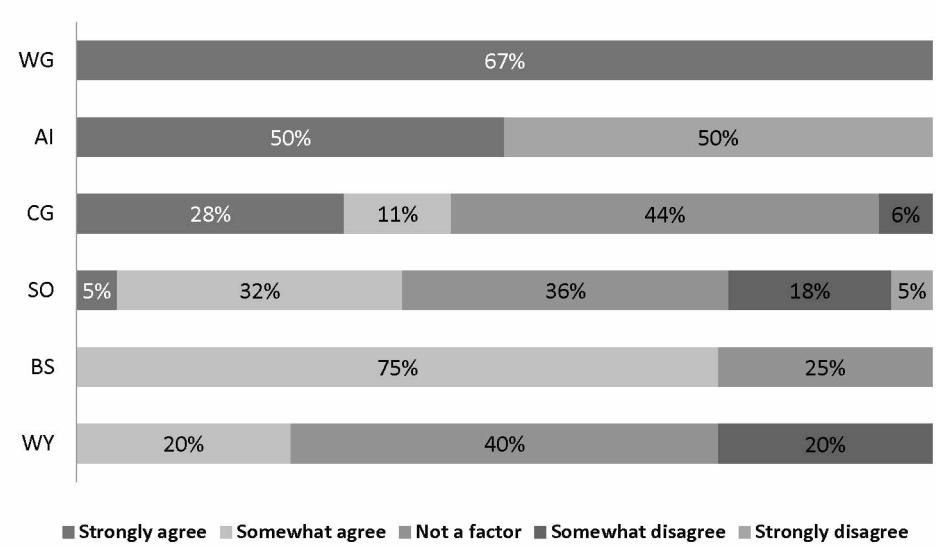

Figure 3.47. Degree of agreement with the statement that fuel prices concerns led to sablefish fishermen making longer trips

For the fourth question "I fished my quota shares with other QS holders", the response was Central Gulf with around 50 percent strongly agreeing and 17 percent somewhat agreeing. Central Gulf sablefish quota holders strongly agree that fishing together is important to conserve fuel. The response was similar between areas Southeast Outside, West Yakutat with around 46 percent agreeing but this was much lower with area Bering Sea stated that "not a factor" was around 75 percent of the response.

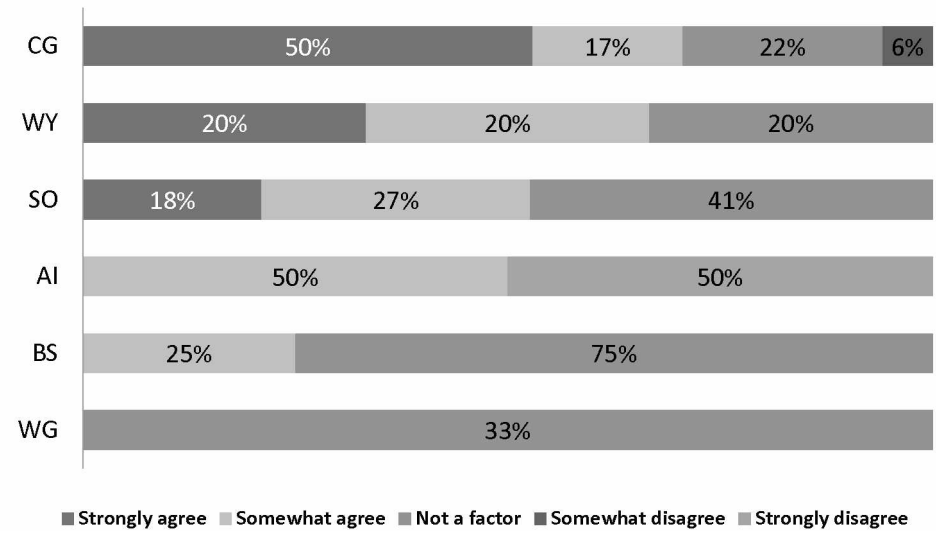

Figure 3.48. Degree of agreement with the statement that fuel prices concerns led to sablefish fishermen fishing their quota shares with other QS holders

The final question in this section "I ran the engine less was highest in area Southeast Outside, and Bering Sea, and West Yakutat with Central Gulf being slightly lower but still fairly high. Many sablefish

quota share holders also agreed that by running the vessel less at a lower rate. Many commercial fishing vessels can decrease fuel consumption by backing off the throttle to the point that stern waves starts to flatten, causing the fuel consumption to drop (Fisk, 2009). This has the strongest agreement with the more remote area of the Aleutian Islands with the other areas being slightly lower but in total agreement on this survey question.

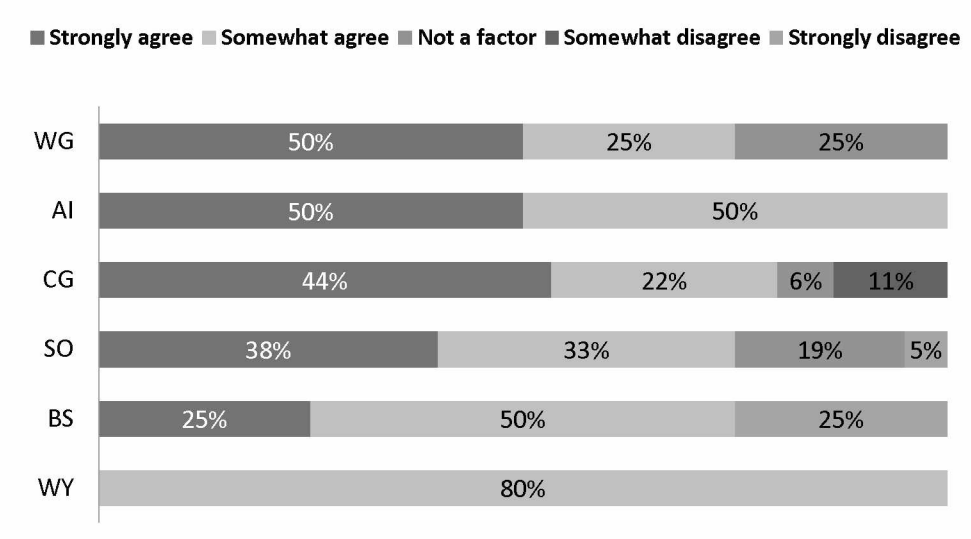

Figure 3.49. Degree of agreement with the statement that fuel prices concerns led sablefish fishermen to run their engine less

In general, these questions show that there are a number of different strategies fishermen use to mitigate the effects of high fuel costs. Running the engine at a lower RPM seems to be the strongest approach for both halibut and sablefish quota share holders. Making fewer trips was most selected for halibut QS holders and fishing closer to home port was selected as second highest by sablefish QS holders.

Question 19. Do you plan on purchasing more halibut quota share in the future.

This question asked "Do you plan on purchasing more halibut quota share in the future?" Respondents for halibut were mostly unsure about their interest in purchasing additional QS. Almost fifty percent responded that they did not know if they were going to buy more quota. Response was similar across all areas with the exception of Area 4 (Aleutian Islands and Bering Sea), where respondents indicated they were planning to purchase more quota.

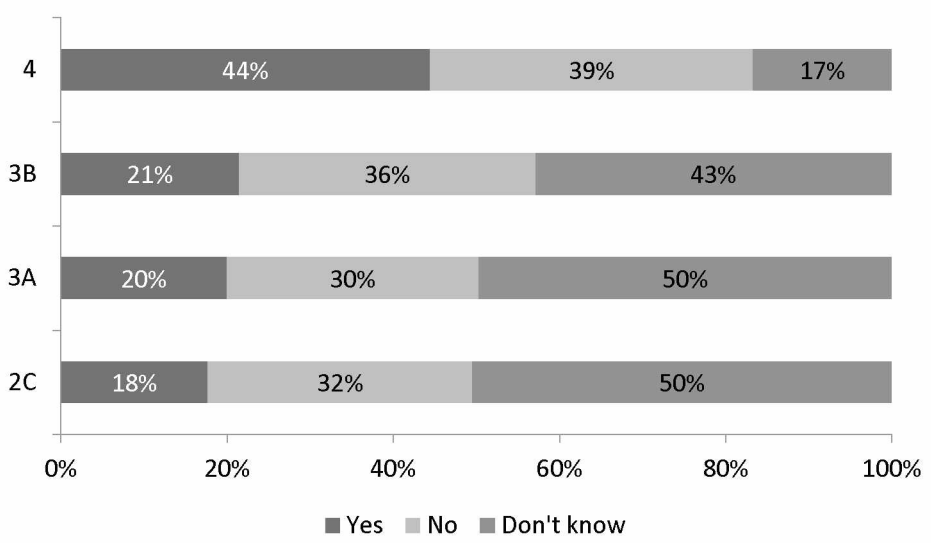

Figure 3.50. Purchase more halibut quota shares in the future

Question 20: If you answered "No" or "Don't know" in Question 19, please rate your level of agreement.

Based on answers to Question 19, this question asked "If you answered "No" or "Don't know" in question 19, please rate your level of agreement with the following statements." The survey included the following options: Cannot afford more QS at this time; not enough time (to fish more QS); Plan to retire in the near future; concerned about annual limits; concerned about charter catches; concerned about charter catches; find it too difficult to obtain financing; plan to buy QS in a different fishery.

Table 3.16 Plans for not purchasing more halibut QS.

	No opinion	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree	Total responses
Cannot afford more QS at this time	0.04	0.05	0.05	0.22	0.3	0.33	276
Not enough time	0.04	0.35	0.06	0.43	0.09	0.03	275
Planning to Retire in the near future	0.06	0.26	0.03	0.38	0.19	0.08	279
Concerned about annual limits	0.03	0.01	0.02	0.09	0.35	0.5	282
Somewhat agree	0.02	0.03	0	0.08	0.19	0.68	281
Strongly agree	0.05	0.08	0.05	0.43	0.25	0.12	276
Total responses	0.19	0.19	0.04	0.43	0.11	0.03	272

Responses for asking if there is a plan to purchase more halibut in the future varied. Area 4 was higher in this category, showing the highest willingness to purchase more QS at this time. The other Areas

3A and 3B are similar to the averages for this answer. Area 2C had a lower level of agreement in purchasing more QS, possibly related to the lower annual limits and concerns about charter fishing.

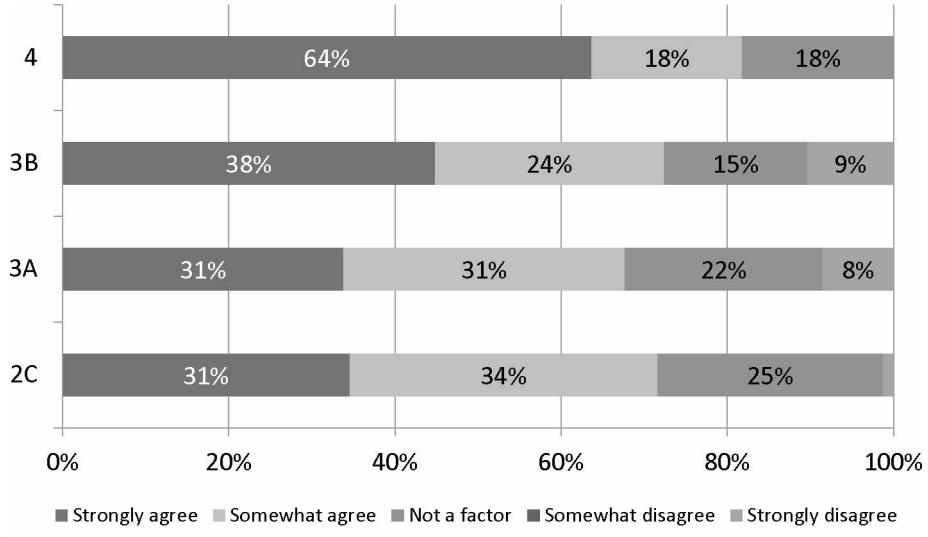

Figure 3.51. Cannot afford more halibut QS at this time.

For the second statement "I do not have enough time to fish more QS than I currently own," most respondents believed this was not a factor. QS owners only have a certain number of days to fish each season, so this question was targeting if this was a factor in their decision to purchase more QS. Most of the response in Areas 2C, 3A, 3B, and 4 selected not a factor, averaging around 40 percent. The highest percent of responses to disagree with this question was in Area 4.

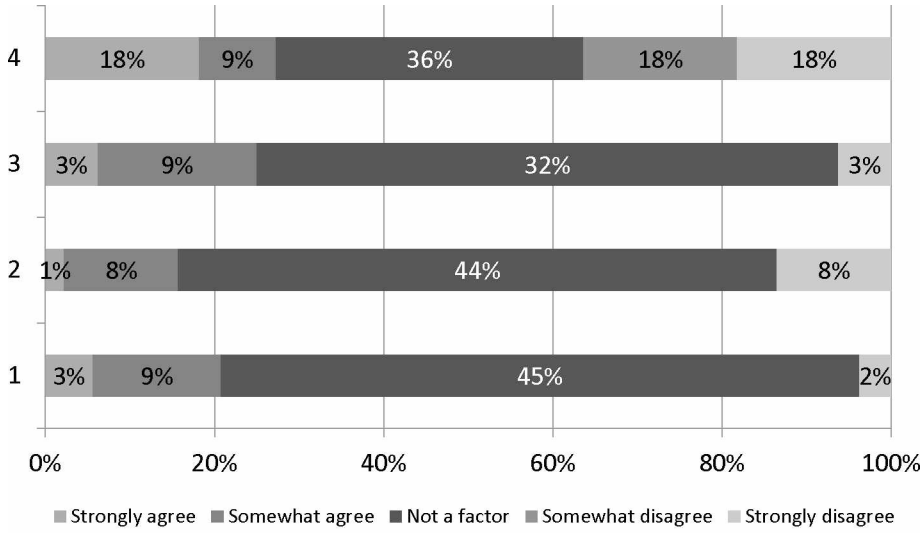

Figure 3.52. Did not have enough time to fish the halibut QS

The third part of the question "I am planning to retire in the near future from the halibut fishery," most respondents believed this was not a factor. A number of halibut QS holders agreed to this with a response percentage between 25 and 32 percent. The largest percentage agreeing to this question was Area 3B which was just over 32 percent.

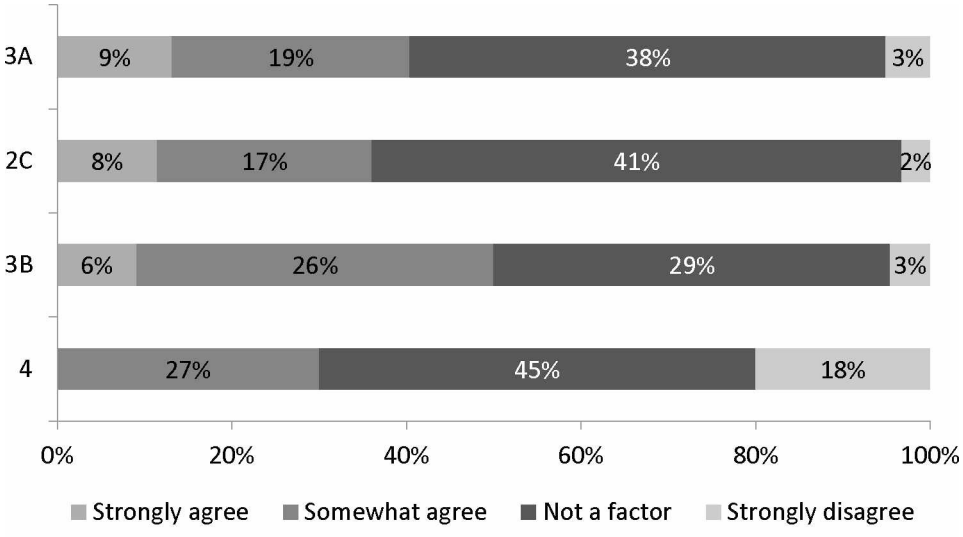

Figure 3.53. Planning to retire in the near future from halibut fishing

In the fourth statement "I am concerned about declining annual limits," respondents were in strong agreement across all areas. There has been a drop in Total Allowable Catch (TAC) in the past several years for the halibut fishery, and this has led to widespread concern about annual limits.

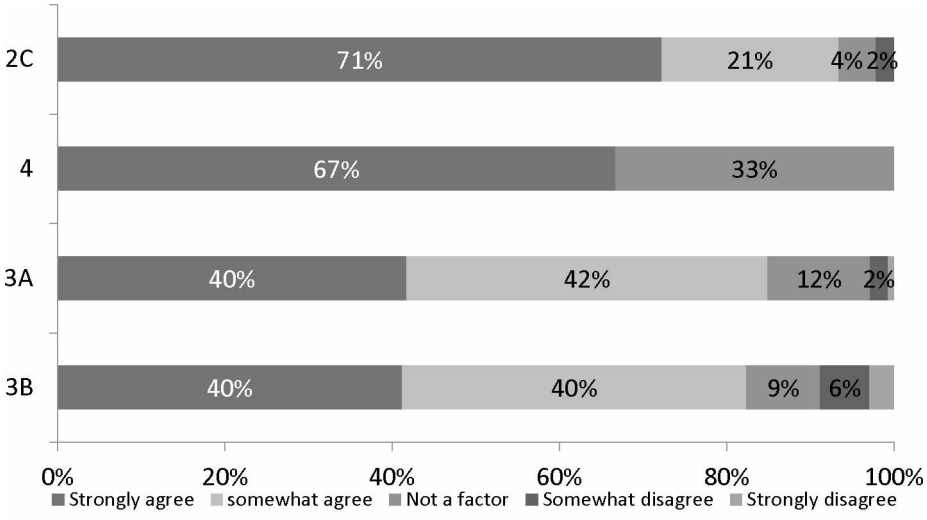

Figure 3.54. Concerned about declining annual limits for halibut holdings

The response was highest in Area 2C with 71 percent strongly agreeing and 21 percent somewhat agreeing. The lowest agreement was Area 4, and it was still relatively high at 67 percent, showing some concern about the declining limits in all areas.

The fifth statement "I'm concerned about increased sport fishing charter catches" captured strong agreement. Charter fishing has become more of an issue in recent years with the continued growth of charter fishing. In recent years, limits have been imposed on the halibut charter fishery in Areas 2C and 3A. The highest level of agreement for this question for the halibut areas was 2C with 85 percent strongly agreeing and 9 percent agreeing. Area 4 was 30 percent lower than Area 2C, with 18 percent strongly agreeing and 36 percent agreeing.

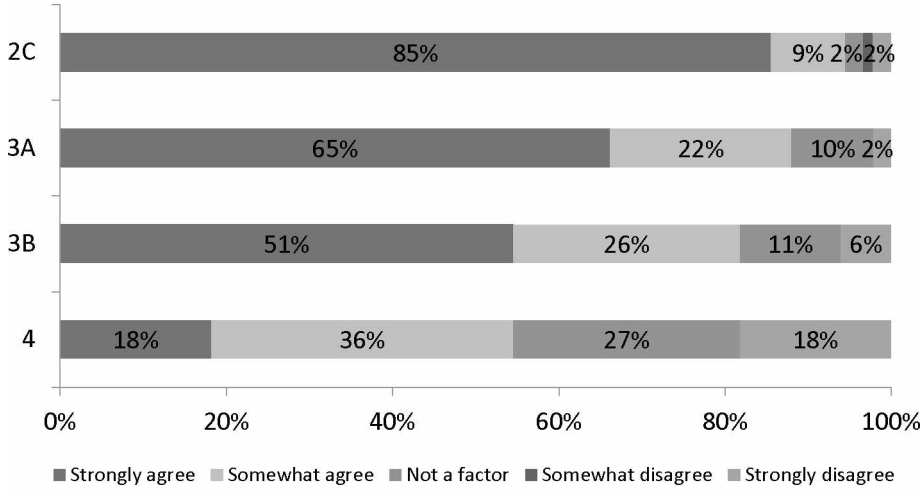

Figure 3.55. Concerned about increased sport fishing charter catches for the halibut fishery

The sixth statement "It is too difficult to obtain financing" showed markedly different response by area. One of the difficulties in obtaining additional QS holdings for halibut is to obtain financing. The most remote area 4 had the highest percentage agreeing with this question with 27 percent strongly agreeing and 36 percent agreeing for a total of 63 percent, the highest in this category. Area 2C was the lowest showing the highest level of "not a factor" (53 percent).

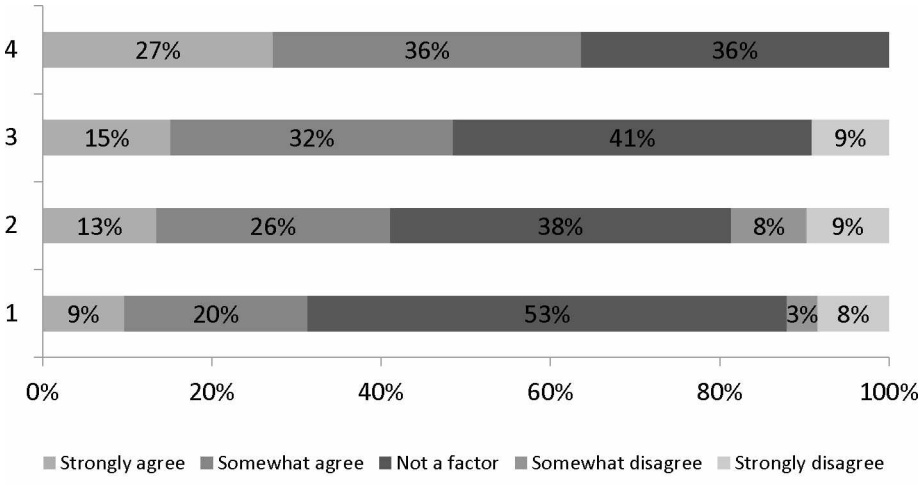

Figure 3.56. It is too difficult to obtain financing to purchase halibut

The final statement for this set for halibut was "I plan to buy QS in a different fishery". This statement indicated a QS holder is interested in exiting the halibut fishery. Most of the responses for this part of the survey for all areas was not a factor. For all of the responses, disagreement was higher than the agreement.

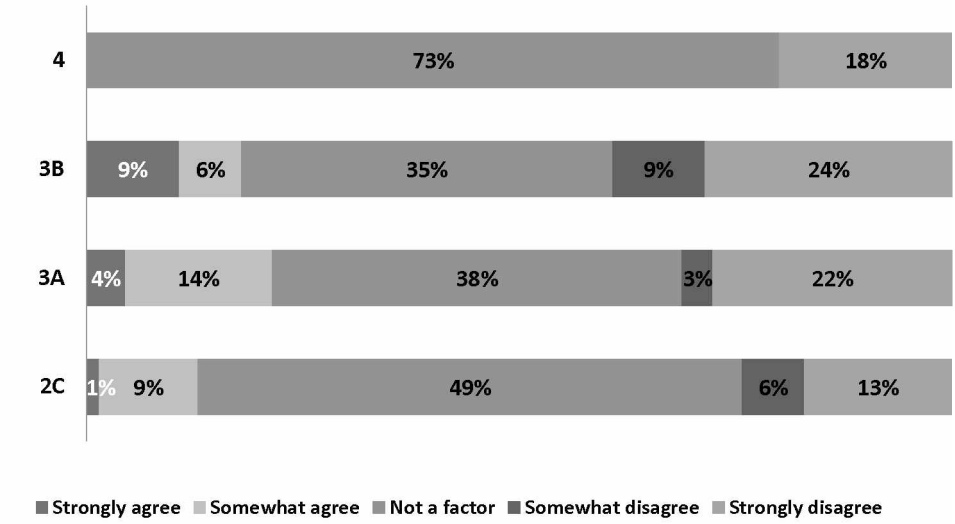

Figure 3.57. Plan to buy QS in a different fishery.

Question 21. Do you plan on purchasing more sablefish quota share in the future.

Question twenty one asked the respondents about plans for future acquisition of sablefish quota shares. The response for question 21 included an average 40.3 percent of respondents that did not know if they were going to buy more quota, 28.4 percent stating that they would buy more, and 31.3 percent said they would not. The response for purchasing more quota was highest in Western Gulf followed by Bering Sea and

Aleutian Islands, with the lowest in Southeast Outside.

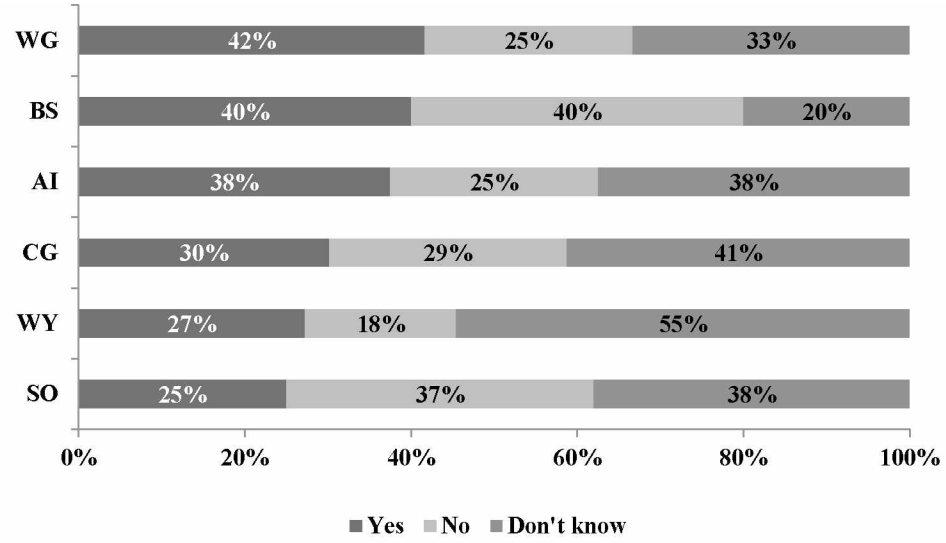

Figure 3.58. Purchase more sablefish quota shares in the future

Question 22: If you answered "No" or "Don't know" in Question 21, please rate your level of agreement.

This next question asks to define the reason the respondent is not interested in purchasing more quota. If you answered "No" or "Don't know" in question 21, please rate your level of agreement with the following statements

Table 3.17. Plans for not purchasing more sablefish quota shares

	No opinion	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree	Total responses
Cannot afford more QS at this time	0.02	0.07	0.07	0.21	0.34	0.29	150
Not enough time	0.04	0.31	0.06	0.5	0.05	0.04	150
Planning to Retire in the near future	0.05	0.25	0.03	0.36	0.21	0.1	153
Concerned about annual limits	0.02	0.02	0.03	0.15	0.38	0.4	154
Concerned about charter catches	0.03	0.04	0	0.36	0.18	0.38	151
Too difficult to obtain financing	0.05	0.09	0	0.38	0.25	0.13	150
Plan to buy QS in a different fishery	0.17	0.17	0.05	0.53	0.05	0.02	149

The first table category "Cannot afford more QS at this time" was high in all areas. The most remote area of the Aleutian Islands agreed to this question with the highest response of almost 83 percent and with Western Gulf disagreeing with the highest percentage with close to 38 percent.

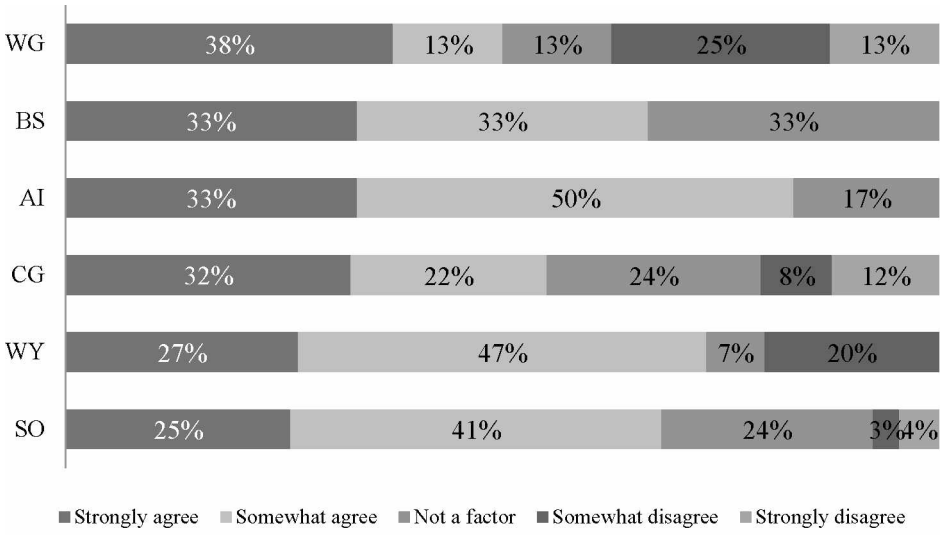

Figure 3.59. Cannot afford more sablefish QS at this time

The second category "I do not have enough time to fish more QS than I currently own" generally shows strong disagreement. QS sablefish owners are limited on the number of days to fish their quota and this question targeted if this was a factor in their decision to purchase more QS. Bering Sea agreed to this question with the highest response of 67 percent and Western Gulf disagreed with the highest percentage with close to 50 percent. Fishing in the Bering Sea may be a much more time consuming fishery because of area's remoteness and expenses, compared to other areas. Foul weather limits the number of fishing days.

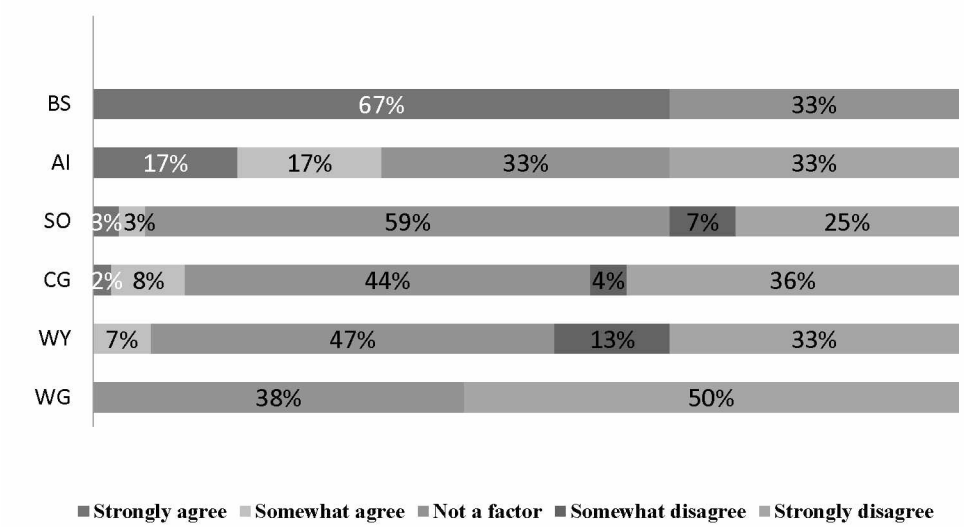

Figure 3.60. Not enough time to fish the sablefish QS

The third part of the question "I am planning to retire in the near future" showed the number of sablefish QS holders interested in retiring after the 2009 season.

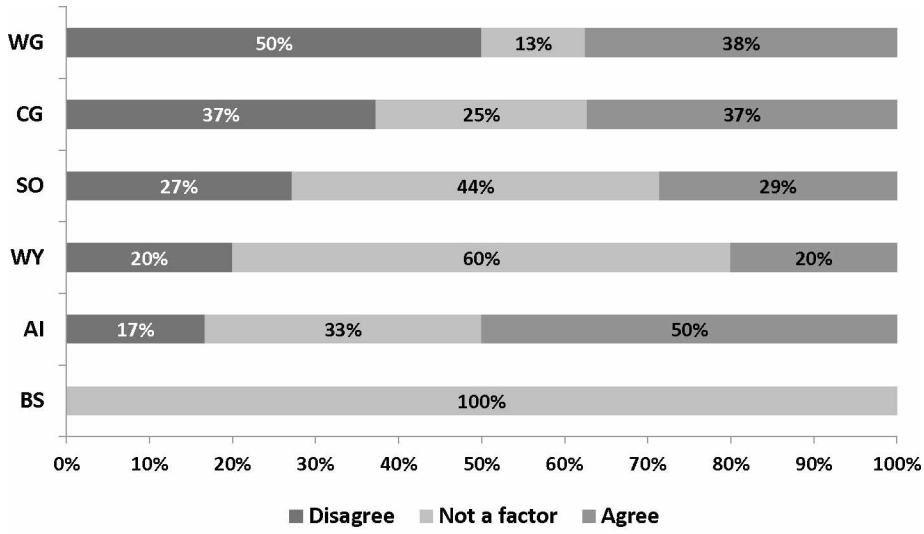

Figure 3.61. Planning to retire in the near future from sablefish fishery

The fourth statement "I am concerned about declining annual limits" shows a drop in TAC in the past several years for the sablefish fishery due to the increase in the QS/IFQ ratio. This has led to all areas showing a decline in fishable pounds for the sablefish fishery. The response was highest in areas Western Gulf, CG, and Southeast Outside with an average 79 percent of respondents agreeing. The lowest area was in Aleutian Islands and Bering Sea with only 33 percent agreeing. These responses show some concern about the declining limits in certain areas.

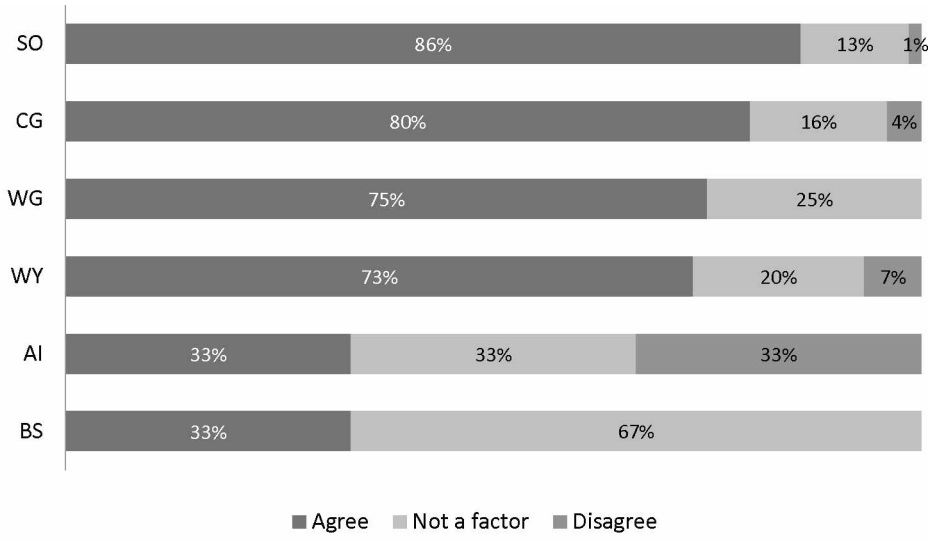

Figure 3. 62. Concerns about declining annual limits for sablefish

The fifth category was "I'm concerned about increased sport fishing charter catches." Sport fishing has become more of an issue in recent years with the continued growth of charter fishing for halibut and some charter outfits are targeting sablefish.

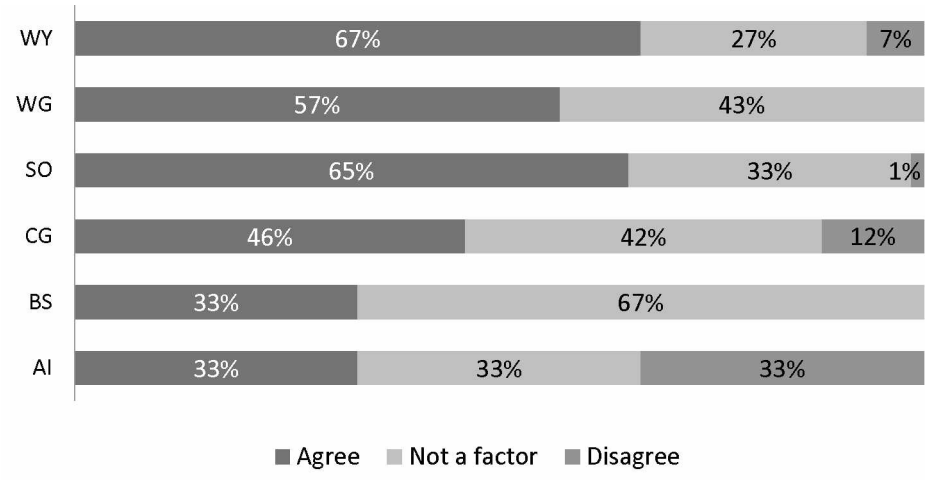

Figure 3.63. Concerned about increased sport fishing charter catches for the sablefish fishery.

There are a few charter outfits that target sablefish and have exclusive Japanese and Hawaiian clientele. The response from the survey shows that areas West Yakutat, Western Gulf and Southeast Outside agreed with this statement and Aleutian Islands and the Bering Sea agreed slightly less. Currently, the ADF&G has a four fish daily bag limit for sablefish for both residents and non-residents in Southeast Alaska. No other area in Alaska has a daily or annual bag limit as of 2010. (ADFG)

The sixth part "It is too difficult to obtain financing," again indicates that the most remote areas have the most difficulties in obtaining additional financing for sablefish QS. The most remote area, the Aleutian Islands, had the highest agreement in this category and West Yakutat the lowest, with 40 percent disagreement.

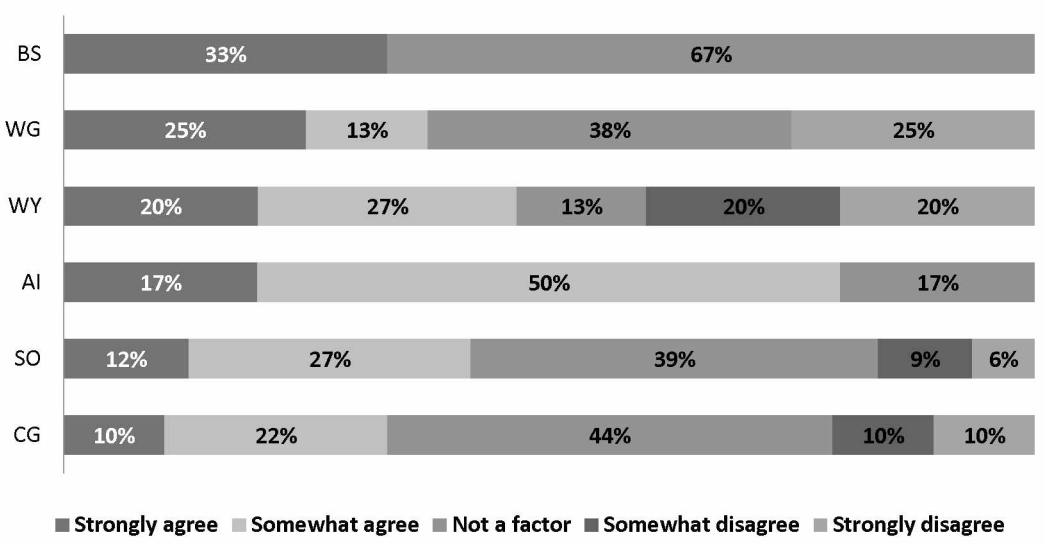

Figure 3.64. It is too difficult to obtain financing to purchase sablefish QS.

The final category for sablefish "I plan to buy QS in a different fishery," showed that most respondents disagreed. If a QS holder was interested in exiting this fishery, agreement ranged from 8 to 9 percent, while disagreement ranged between 17 to 38 percent.

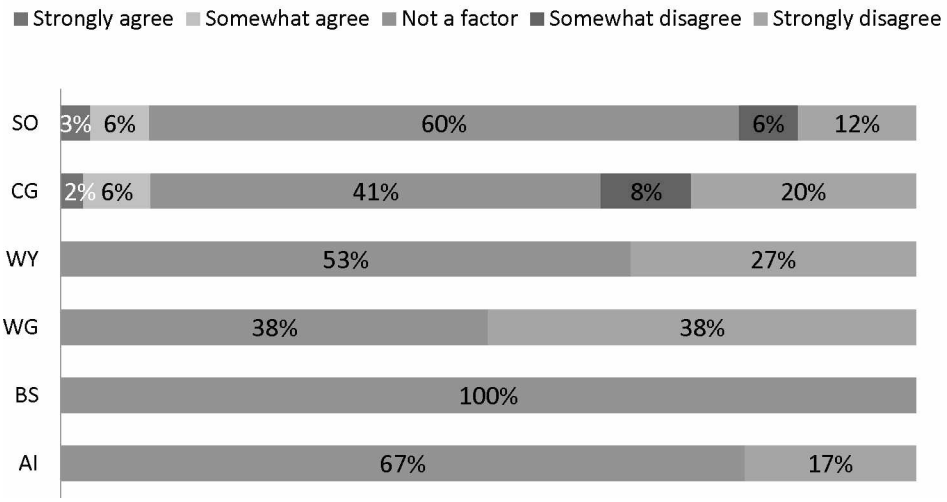

Figure 3.65. Plan to buy QS in a different fishery other than sablefish.

Conclusion

The results from the first sections found that typically more halibut quota share holders fish on their own vessels than do sablefish quota share (QS) holders. Halibut QS holders had smaller crew than sablefish quota share holders and sablefish crew tended to stay on the entire season compared to halibut crew. Halibut and sablefish have similar results when looking at the number of additional QS holders on the vessel while

fishing. Almost 40% stated they had one additional QS holder onboard their vessel and 10% of the respondents stated they had five QS holders onboard their vessel.

The second section focuses on the residency of crew in relation to their fishing grounds. The results showed that some of the smaller vessels had two crewmembers and the larger vessels had over six crewmembers. The response showed that the larger vessels with larger crewmembers had more crew living outside of Alaska. For example, in area 2C (Southeast), more halibut crewmembers live in the same area as they fish. This is also true with area 3A, Kodiak to Yakutat; almost 60% live in the same area they fish. In contrast, area 3B (Sandpoint) has more crew living outside Alaska. The larger sablefish vessels with the larger crews, crewmembers tended to live outside the state. Southeast sablefish fishing area extends from Ketchikan to Yakutat, and the crews are mostly local to that area. Only 20% live outside Alaska. By contrast, in the Aleutian Islands, which include Adak, the crews mostly live out of state with only 6% being local. For both the halibut and sablefish fisheries, close to 50% of respondents stated that there was not a problem in hiring crews. By area, it is slightly easier to hire crew for halibut in Southeast Alaska and Kodiak compared with the Aleutian Islands and Bering Sea. The sablefish fishery also has some difficulty finding crew in the Aleutian Islands, Bering Sea, and West Yakutat, with less of a problem in Southeast Alaska, Western Gulf, and the Central Gulf of Alaska.

The third section of the survey asked: "In which community did you hire your crew and purchase most of the vessel supplies for each target fishery?" Respondents replied they purchased their supplies in Alaska's larger coastal cities. Home ports such as Kodiak, Petersburg, and Sitka offer more supplies than merely for their home fleet vessels. This is also true to a smaller extent in Cordova, Dutch Harbor, Hoonah, and Juneau. For the sablefish fishery, Dutch Harbor and Petersburg are key suppliers for fishing supplies. Other important supply ports include Homer, Juneau, and Kodiak.

The fourth section of the questionnaire surveys the percentage of gross revenues spent on operational costs. The percentage of the gross revenue spent on halibut operational costs by the quota share holder are higher in Aleutian Islands and Bering Sea, followed by Area 3B (Sand Point). Operational costs include fuel, insurance, bait, fishing gear, and vessel maintenance. This is expected because those areas are more remote than the other areas. Results for the sablefish fishery expenses were more mixed. Fuel costs were higher in Aleutian Islands while insurance costs were higher in the Bering Sea. Bait seemed to be a low cost item for all regions. Fishing gear expense was higher in the Aleutian Islands and maintenance costs were higher in Bering Sea and Central Gulf.

Gross revenues spent on vessel share, crew share, and captain share for the halibut and sablefish IFQ Fishery varied by area. For halibut, the Aleutian Islands and the Bering Sea quota shareholders paid a higher

percentage for the vessel share. Sablefish A share and large sablefish QS holders had the largest percentage selected to vessel share. For crew share, the larger halibut QS holders paid a higher amount to their crew than did larger sablefish holders. In general the larger vessels paid a higher percentage to the crew than did the smaller vessels. The smaller halibut vessels had the highest percentage of captain share. Most halibut and sablefish quota shareholders answered that fuel prices did not disrupt their fisheries in the 2009 season. Of the respondents that did select that fuel prices affected their 2009 fishing season for halibut and sablefish, they ran the engine less, fishing closer to delivery port, and made fewer trips. Viewing each question by area for halibut and sablefish, all areas selected, "ran the engine less" as the way most QS holders dealt with the increase in fuel prices.

The final question asked, "Do you plan on purchasing more halibut quota share in the future?" Respondents for halibut were mostly unsure about their interest in purchasing additional QS. Almost fifty percent responded that they did not know if they were going to buy more quota. Response was similar for sablefish across areas with the exception of Area 4 (Aleutian Islands and Bering Sea) where respondents indicated they were planning to purchase more quota.

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Appendix 3.1 Survey Questionnaire

The Alaska IFQ halibut and sablefish fisheries IFQ program is an important fisheries management program not just for Alaska, but the entire world. Lessons from this fishery have shaped and will continue to shape the design of quota programs around the globe.

We greatly appreciate your assistance in answering this short survey on crew makeup in the current halibut and sablefish fisheries. Comparatively little data are available regarding crew and their connection to regional economies. With your help this survey will fill in some of those missing pieces. Results from this survey allow us to measure the economic impact of the quota shareholders and crew on different communities throughout the North Pacific.

The survey is funded by the Alaska Sea Grant Rapid Response Program, and led by Glenn Haight, Fisheries Development Specialist with Alaska Sea Grant Marine Advisory Program. The survey was designed and will be analyzed by Alexander Kotlarov, a PhD student with the University of Alaska, Fairbanks, working under the guidance of Dr. Keith Criddle.

The survey includes 22 questions. We understand that your crew levels may fluctuate with fishing season and year; we are looking for answers that best reflect conditions during the 2009 fishing year.

The survey has been sent to a stratified random sample of halibut and sablefish quota share (QS) holders. You will be surveyed as a QS holder in an area with a particular size vessel, thus your response is important to ensure that our survey results are representative of each component of the fleet.

All responses will be treated confidentially. All confidential data will be destroyed upon completion of the survey. Only aggregate responses organized by IFQ category, vessel size, and size of QS holdings will be retained and reported. Aggregate responses will not be published for any grouping if there are fewer than 3 responses.

Upon completing the survey, if you enter contact information, you will be entered into a prize drawing. You may complete the survey on paper or online, but you will only be awarded one entry into the drawing for the survey whether you enter by mail, online, or both. The survey may be taken on-line through Survey Monkey. The link for this site is found on the Marine Advisory Program web site here □□http://seagrant.uaf.edu/map/. With sufficient response, the survey will complete by March 31, 2010. Prize drawings will occur on March 31, 2010.

If you have any questions about the handling of data, please contact Glenn Haight, 907-796-6046 or glenn.haight@alaska.edu.

Thank you

1) Do you typically fish your QS on a vessel you own or on a vessel owned by someone else? (please circle)

Fish on own vessel Fish on someone else's vessel

2) Please circle all of the areas you fished for halibut and for sablefish during 2009.

Halibut	2C	3A	3B	4A	4B	4C	4D
Sablefish	Southeast Outside	West Yakutat	Western Gulf	Aleutian Islands	Bering Sea		

3) How many licensed harvesting crewmembers (not counting yourself) were onboard your vessel (or onboard a vessel you used) on a typical trip in 2009. Please record one number for each target species you fish.

Halibut trips	Sablefish trips	Fishing trips for other species

4) Please record the approximate percentage of your total IFQ trips, by target species, taken by a typical crew member in 2009. (For example, if you took 10 halibut trips in 2009 and a typical crew member accompanied you on half those trips, you would record a value of 50 %.)

Halibut trips	Sablefish trips	Fishing trips for other species

5) How many quota share holders (not counting yourself) fished (or had a hired master fish) their quota shares on your vessel in 2009? Please record one number for each target IFQ species you fish.

Halibut trips	Sablefish trips

6) Question 6 relates to your answers in Question 7. These two questions seek to determine where your crew lives in relation to where the majority of your fishing activity took place? (For instance, if a majority of your halibut harvest occurs in Area 2C, does a particular crew member reside in Southeast Alaska or do they reside in another area?)

Circle the halibut harvest area where a majority of your fishing activity occurs.

Halibut Area						
2C	3A	3B	4A	4B	4C	4D

7) Identify each crew member's residency in relation to the halibut area identified in #6. For instance, if in Question #6 you identified most of your halibut harvest in Area 2C, and Crew Member 1 resides in a Southeast Alaska community, you would check "Live is same area".

Crew Member	Live in same area	Live elsewhere in Alaska	Live outside Alaska
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Additional comments: _____

8) Question 8 relates to your answers in Question 9. These two questions seek to determine where your crew lives in relation to where the majority of your fishing activity took place? (For instance, if a majority of your sablefish harvest occurs in Southeast Outside, does a particular crew member reside in Southeast Alaska or do they reside in another area?)

Circle the sablefish harvest area where a majority of your fishing activity occurs.

Sablefish crew				
Southeast Outside	West Yakutat	Western Gulf	Aleutian Islands	Bering Sea

9) Identify each crew member's residency in relation to the sablefish area identified in #8. For instance, if in Question #8 you identified most of your sablefish harvest in Southeast Outside, and Crew Member 1 resides in a Southeast Alaska community, you would check "Live is same area".

Crew Member	Live in same area	Live elsewhere in Alaska	Live outside Alaska
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Additional comments: _____

10) Over the past 10 years, has it gotten easier or harder to hire qualified crew? Please circle one response for each target species you fish.

Halibut	Much easier	Somewhat easier	No change	Somewhat harder	Much harder

Sablefish	Much easier	Somewhat easier	No change	Somewhat harder	Much harder

Additional comments: _____

11) In 2009, please list the port you operated out of most often while targeting.

Halibut: _____

Sablefish: _____

12) In 2009, in which community did you purchase most of your crew and vessel supplies for each target fishery.

Halibut: _____

Sablefish: _____

13) Roughly what percentage of your 2009 gross revenues from IFQ fisheries was spent on the following operational costs? Please use (X) to indicate your answer.

Cost	0 –3%	4 – 6%	7–10%	11–15%	16–20%	21% or greater
Fuel and lube						
Crew and liability insurance						
Bait						
Fishing gear						
Vessel maintenance						

14) Roughly what percentage of your 2009 gross revenues from IFQ fisheries was spent on the following operational costs? Please use (X) to indicate your answer.

Cost	0–9%	10–19 %	20–29 %	30–39 %	40–49 %	50% +
Crew share						
Captain share						

Vessel share						

15) Did fuel prices disrupt your fishing for halibut during 2009?

Yes No

16) If you answered "Yes" in Question 15, please rate your level of agreement with the following statements.

	No opinion	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree
I fished closer to my delivery port						
I made fewer trips						
I made longer trips						
I fished my quota shares with other quota share holders						
I ran the engines less						

17) Did fuel prices disrupt your fishing for sablefish during 2009?

Yes No

18) If you answered "Yes" in Question 17, please rate your level of agreement with the following statements.

	No opinion	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree
I fished closer to my delivery port						
I made fewer trips						
I made longer trips						
I fished my quota shares with other quota share holders						
I ran the engines less						

Additional comments: _____

19) Do you plan on purchasing more halibut quota share in the future?

Yes No Don't know

20) If you answered "No" or “Don’t know” in Question 19, please rate your level of agreement with the following statements.

	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree
I cannot afford more QS at this time					
I do not have enough time to fish more QS than I currently own					
I am planning to retire in the near future					
I am concerned about declining annual limits					
I am concerned about increased sport fishing charter catches					
It is too difficult to obtain financing					
I plan to buy QS in a different fishery					

Additional comments: _____

21) Do you plan on purchasing more sablefish quota share in the future?

Yes No Don’t know

22) If you answered "No" or “Don’t know” in Question 21, please rate your level of agreement with the following statements.

	Strongly disagree	Somewhat disagree	Not a factor	Somewhat agree	Strongly agree
I cannot afford more QS at this time					
I do not have enough time to fish more QS than I currently own					
I am planning to retire in the near future					
I am concerned about declining annual limits					
I am concerned about increased sport fishing charter catches					
It is too difficult to obtain financing					
I plan to buy QS in a different fishery					

Additional comments: _____

Thank you for your time. Your information is a valuable contribution for assessing the impact of quota programs

Please submit your survey to:

Glenn Haight, Fisheries Business Specialist
Alaska Sea Grant Marine Advisory Program
1108 F Street, Room 215
Juneau, Alaska 99801

Please enter the following contact information for entry into the prize drawing.

Name: _____

Mailing address: _____

Telephone number: _____

Email address: _____

Chapter 4. A Review of Community Support Measures Included in Alaskan Fisheries and a Roadmap for their Use in Sustaining and Rebuilding Small Fishing Communities

Abstract

This chapter looks at how Alaskan commercial fisheries have evolved and how this has affected small coastal communities. Alaska's commercial fisheries policies and regulations have maintained the biological integrity of the ecosystem, but they have also, intentionally or inadvertently shaped the economies of fishery-dependent communities along the Alaskan coastline.

When the MSA expanded U.S. fishing boundaries from 12 miles to 200 miles offshore of the United States coast. This encouraged the expansion of U.S. fishing fleets. This expansion was particularly dramatic in the U.S. EEZ off Alaska, where groundfish stocks had been exploited, almost exclusively, by foreign-flagged fishing fleets. MSA provisions that promoted the Americanization of fisheries in the U.S. EEZ led to a rapid evolution in the fisheries off Alaska. Between 1976 and 1990, the groundfish fisheries off Alaska went from largely foreign catching and processing to joint ventures between U.S.-flagged catcher boats and foreign-owned processors and then to a fully Americanized fishery. By the early 1990s, many of these American fisheries had fleets that could quickly harvest the total annual catch, and the competition among the vessels participating in these fisheries continued to increase (Strong and Criddle 2013). The resulting race-for-fish reduced the value of the landed catch, increased the risk of overharvest, increased risk-taking by fishermen, and reduced the economic viability of fishing.

Consequently, the NPFMC began to adopt fishery policies to restrict access to the fisheries. These include the Community Development Quotas (CDQs) for 7.5% of the pollock, Individual Fishing Quotas (IFQs) were implemented in the halibut and sablefish fisheries in 1995. Coop allocations were implemented in the pollock fishery in 1999. The scallop fishery was closed to new entrants in 2000. IFQs and Individual Processor Quotas (IPQs) were implemented in the Bering Sea and Aleutian Island (BSAI) crab fisheries in 2005. And, coop allocations were introduced in the Gulf of Alaska (GOA) rockfish fishery in 2007, in the BSAI groundfish trawl fishery in 2008, and in the BSAI groundfish longline fishery in 2010.

Faced with similar challenges, the State of Alaska began in 1973 to limit entry to salmon, herring, and other oversubscribed state-managed fisheries. While restricted access management helped to make the fisheries more manageable and addressed some economic and social concerns, it changed the economic and social dynamics among fishermen, crew, processors, and their Alaskan communities. This chapter explores the attributes, successes, and failures of management measures intended to avoid or mitigate unintended community impacts of restricted access management in state and federal fisheries off Alaska.

Implementing a catch share program is challenging and frequently controversial even though catch share programs are widely recognized as a practical approach to end overfishing (Costello et al. 2008; Grimm et al. 2012; Melnychuk et al. 2016). Transitions to LEP or catch shares in different fisheries have affected different communities differently. While fishing and fishing-dependent economic activity has increased in some communities, many small remote rural Alaska communities have experienced a decline in their engagement in halibut, sablefish, and salmon fisheries in the wake of the transition from open access to limited entry or catch shares (NOAA 2010; CFEC 2018). Since catch share and LEP programs were implemented, policymakers have recognized this trend and have tried to assist communities with special programs; some of which have been successful, others less so.

This paper focuses on the halibut and sablefish IFQ program (NRC 1999a), but also looks at some of the other major commercial fisheries in Alaska; these include the salmon, pollock, and crab fisheries. Alaskan fisheries are often looked at worldwide as successful from a biological perspective, but all of them have had rough periods in their histories, and some have experienced economic disasters, with widespread adverse social and economic consequences for vulnerable communities (Criddle 2012).

After a review of restricted access management programs and rural community protection measures, this chapter turns to the development of a roadmap to help rural communities sustain or reestablish their fishing fleets. Several steps could be taken to help these communities regain quota. For example, a first step might be to provide communities with a readily accessible description of all the programs that are currently available and how the communities could take advantage of these opportunities. Some of the regulations are complex and have reporting requirements that an accessible description would elucidate for communities. A second step might be to help communities identify and qualify for funding to support the acquisition of quota shares. A third step might be to help communities identify options for allocating fishing opportunities to community members and recovering costs of quota share acquisition.

Another avenue explored in this paper is the development of fisheries trusts. Fisheries trusts are patterned after farm trusts, and other such land trusts structured to maintain traditional rural land uses and associated communities. There are several fisheries trusts in the United States, including a newly formed trust in Sitka, Alaska, these were all established to help small communities and fishermen gain entry into the limited entry fisheries.

The last section of this paper looks at the outcome of the programs and a discussion of the current marine policy issues related to sustaining and rebuilding small fishing communities.

Introduction

This chapter is concerned with the current character and performance of the halibut and sablefish fisheries in light of the Individual Fishing Quota (IFQ) program implemented in 1995 and provides an overview of limited entry and catch share programs implemented in other Alaskan commercial fisheries. The chapter considers how the different management programs in different Alaska fisheries have affected coastal communities. The chapter then examines the efficacy of various programs enacted to help communities maintain their foothold in the fishery.

Many factors can affect a fishery and its successful management. These factors include biological fluctuations, environmental and ecological changes, as well as changes in technology, social preferences, and changes in input and output prices. Fisheries development often follows a pattern of open access leading to over-capitalization, an ever-intensifying race-for-fish, and overharvest and depletion of the fished stock and bycatch species. Fishery managers typically respond with measures intended to scale back the amount of fishing pressure that is exerted on the stock. Managers often begin by shortening seasons or setting trip limits on landed catch. When such measures prove inadequate, managers often introduce caps on the number of vessels or limitations on the amount of gear fished. However, restrictions on numbers of vessels or amounts of gear are usually inefficacious as fishermen can reconfigure input factors to take advantage of unconstrained margins of production technology (Abbott et al. 2015).

Over time, most of the state and federal fisheries off Alaska have come to be managed under LEP or catch share programs. The process of development and adoption of these programs was often long and involved a great deal of input from all levels of the public. Even when such management measures succeed at conserving fish stocks and sustaining marine ecosystems, they often fail to ensure economic sustainability, let alone the sustainability of fishing communities. However, while catch share programs improve economic sustainability and may reinforce the conservation of fish stocks, they may contribute to the decline of remote fishing communities. Alaska fisheries have been held up as world-class examples of fisheries managed correctly and successfully from a biological perspective. However, many of the fisheries in Alaska have been at one time or another experienced or come close to experiencing economic disaster. Moreover, it is generally not recognized that management measures that were intended to improve the conservation of stocks, protect marine ecosystems, and improve the economic condition of fishing vessel owners and processing companies have had adverse impacts on some remote coastal fishing communities.

A brief overview of Alaska's fisheries gives a glimpse of the historical trends that shaped the management of the fisheries. The largest fisheries in Alaska include the salmon fishery, the BSAI pollock

fishery, the BSAI crab fishery, and the halibut and sablefish fishery, each of which has affected the coastal communities in the state of Alaska differently.

Salmon Fisheries

Alaska's salmon fisheries have not always been sustainably managed. Under the influence of cannery owners and with limited federal oversight, many of Alaska's salmon fisheries were overfished (King 2009). Consequently, when Alaska became a state in 1959, the first law enacted for the Alaska salmon fisheries instituted a ban on the use of fish traps (Clark 2006). This ban reduced the oligopsony power canneries exercised over fishermen and favored the expansion of a fleet of small independently-operated boats (King 2009, Cooley 1963). Gaining control of the salmon resources was one of the main reasons for such strong support among Alaskans to make Alaska a state. After statehood and limits placed on canneries, the salmon fisheries experienced a rush of new entrants, in some fisheries, there were so many fishing vessels that the fisheries became unmanageable. In 1972, following a constitutional amendment, the state imposed a limited entry permit (LEP) program to try to control the further expansion of the fishery (Clark 2006). The LEP program capped the number of boats but failed to prevent continued escalation of fishing power because fishermen are often able to increase catches by using new technology or other methods (Wilen 1988; Karpoff 1987). For example, in the Bristol Bay salmon fishery, fishermen got around limits on the number of permits and the 32-foot length vessel length limit by purchasing vessels that were wider and had larger hold capacity. Some of these vessels are 32 feet long and up to 22 feet wide. Exvessel revenue and the market value of LEPs soared in the mid-1980s due to increased global demand for salmon and declines in salmon production in other regions (Ward et al. 2018). However, beginning in the 1990s, aquaculture production in Norway and Chile rapidly increased as technological innovations caused production costs to decline (Asche 1997; Asche et al. 1999; Olson and Criddle 2008; Steiner et al. 2011). By the early 1990s, the enormous global growth of salmon aquaculture depressed salmon exvessel prices in Alaska to such an extent that it caused closures of fishing plants in many Alaskan communities (Herrmann 1992; Herrmann 1994). The declines in inflation-adjusted exvessel prices continued through the mid-2000s, leading to widespread hardship among LEP holders and in fishing communities (Herrmann et al. 2004; Williams et al. 2009; Criddle and Shimizu 2014).

Salmon Fisheries Management

Alaska's salmon fisheries are managed by the Alaska Department of Fish and Game (ADFG). The ADFG operates under a constitutional mandate to conserve fish stocks to maximize sustained harvests (Clark et al. 2006). Article 8§4 of the Alaska constitution states, "Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle." To achieve this objective, ADFG follows a "fixed escapement" harvest strategy intended to

ensure that sufficient numbers of mature salmon escape capture in the fishery and are allowed to spawn in the rivers. Escapement goals are set to maximize long-run sustained yields. Salmon managers open and close fisheries daily to ensure that adequate spawning escapements are achieved: when runs are weak, fisheries are closed; when runs are strong, fisheries are opened. Alaska's focused emphasis on in-season management by local biologists with delegated regulatory authority to ensure sustained yields is a crucial ingredient to successful salmon management (Clark 2006). The state salmon fishery is divided up into regions that are managed separately based on real-time information from daily information on catches and escapement. Salmon are distributed from Southeast Alaska to the Arctic but are most abundant in Bristol Bay, Prince William Sound, and Southeast Alaska. Figure 4.1 presents a recent time series of salmon catches by ADFG management region.

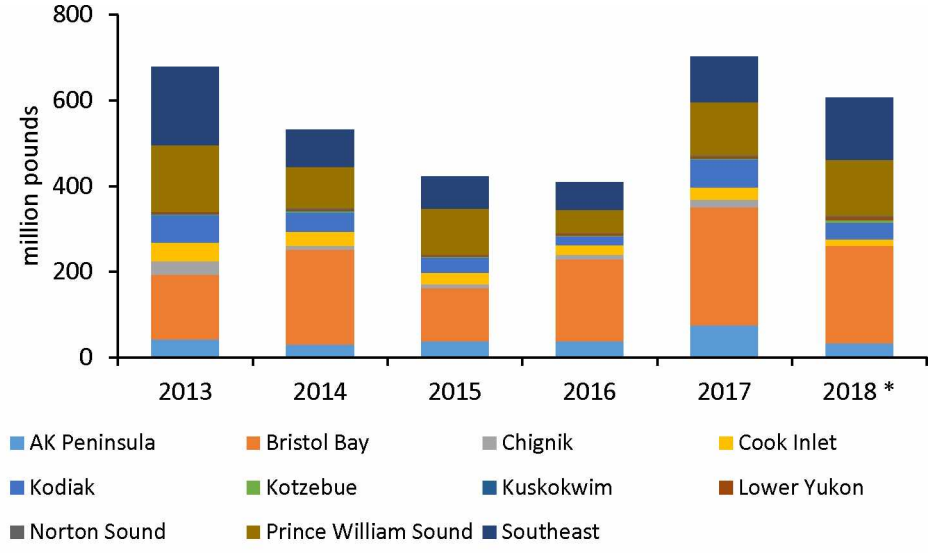

Figure 4.1. Salmon landings (million pounds) by state management region, 2013- 2018 (Brenner 2019) (*2018 is tentative).

Geographic Distribution of Alaska Salmon LEP Holders

While most salmon LEP holders are state residents, over 25% of salmon LEPs are held by nonresidents (Figure 4.2).

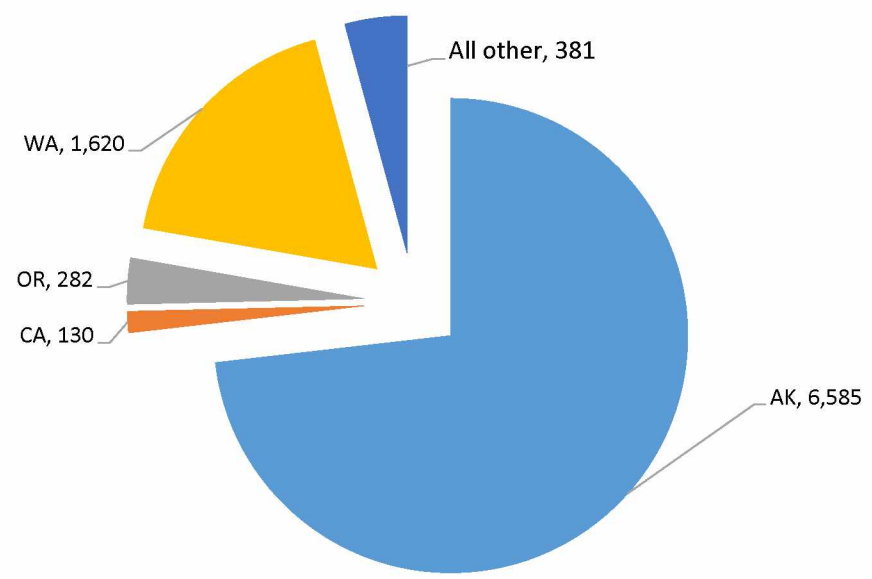

Figure 4.2. Geographic distribution of salmon limited entry permit (LEP) ownership (number of permits) by state of residence in 2018. (Source: CFEC)

As a fishery goes through a transformation from open-access to a limited access program, the number of active fishing vessels is often reduced and can lead to concentration of permit ownership. This outcome was not apparent in the Alaska salmon fisheries because individuals are prohibited from owning more than a single LEP in any given fishery.

Homeports of Alaska Salmon Fishing Vessels

Many nonresident salmon LEP holders homeport their vessels in Alaska. Salmon fishing vessels homeported in Alaska represent 84% of the fleet (7,558 vessels in 2017); the remaining vessels are mostly homeported in Washington (11%), with a few vessels homeported in Oregon (1%) and the remainder in other states (Gho 2018).

Economics of the Alaska Salmon Fishery

In the 2018 Alaska commercial salmon fishery, the harvest of all salmon species was approximately 605.5 million pounds, with an estimated exvessel value of $595.5 million, a 13% decrease from the 2017 value of $696.5 million (ADFG 2018). Alaska's sockeye salmon fishery represents nearly 7% of the total value of all the fisheries in the United States (NMFS 2018). During 2018, sockeye salmon represented 44% of the catch and 60% of the catch value, while pink salmon represented nearly 40% of the catch but only 12% of the catch value. Chum salmon catch was unexpectedly low in 2018 (ADFG 2018).

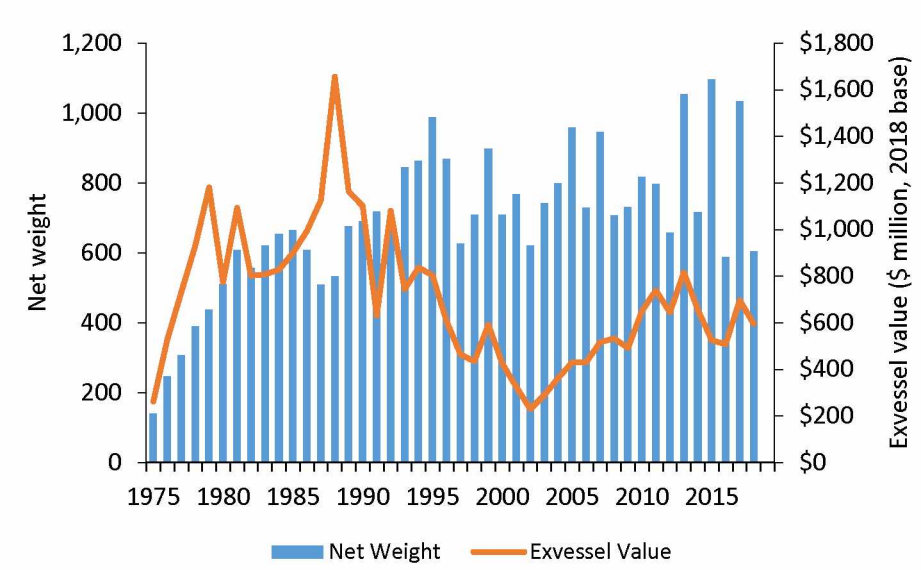

Figure 4.3. Commercial statewide landings (million pounds) and nominal exvessel value ($ million) of salmon, 1975-2018 (ADFG 2018).

From a peak in 1988, exvessel revenues declined precipitously through 2002, even though catches remained high. In terms of inflation-adjusted revenues, the collapse represented a loss of 86% of the 1988 peak. This collapse created social and economic turmoil in salmon fishing communities, because, in addition to affecting annual revenues to fishermen, it reduced the asset value of their LEPs, often to levels below their outstanding loan value (Criddle 2012). Since this time, the salmon fishery has started to recover, but LEP ownership has increasingly shifted away from small rural communities towards larger communities in Alaska and to other states. The rural regions of Alaska have seen the most substantial drop in salmon LEP permit holdings (CFEC 2018). In the 1970s, residents of rural communities held 54% of the total salmon LEPs; by 2004, their share of LEPs had dropped to 44% (CFEC 2012).

Pollock Fisheries

Pollock occur around the North Pacific Rim, from Japan to the U.S. Pacific Northwest, but are most abundant in the Bering Sea and the Sea of Okhotsk. Pollock fisheries occur in State waters off Alaska and in U.S. federal waters in the GOA and BSAI regions. State fisheries for pollock in Prince William Sound are open-access with catch limited by a Guideline Harvest Limit (GHL) that is deducted from the Total Allowable Catch (TAC) for federal waters in the Eastern GOA. State fisheries for pollock in the GOA are also open-access but are subject to state regulations that parallel federal regulations on harvests. Pollock fisheries in GOA federal waters operate under a License Limitation Program (LLP). Evolution of the management of pollock fisheries in the BSAI is described below.

At the time that the MSA was enacted in 1976, the pollock fishery in Alaska was primarily foreign. Americanization provisions of the MSA and declines in the GOA and BSAI crab fisheries encouraged the rapid development of a fleet of U.S.-flagged pollock catcher boats. By the mid-1980s, nearly all GOA and BSAI pollock were harvested by U.S. flagged vessels, while most of the processing occurred aboard foreign-flagged vessels or in foreign-owned onshore processing plants. The joint venture era ended in 1990 as foreign-flagged processing vessels were squeezed out under Americanization provisions of the MSA and as ownership of catcher-processors and onshore processing plants was restructured to comply with Americanization requirements. Because there were no regulatory restrictions on new participation in the fishery, harvesting and processing capacity continued to expand throughout the 1990s. As typical of regulated open-access fisheries (Homans and Wilen 1997), the excess capacity for fishing vessels entering led to shortened fishing seasons, wasteful discards of fish, and the general overcapitalization of the fishery (Strong and Criddle 2013). The excess fishing and processing capacity fueled political battles over allocations between representatives of onshore processing plants and the vessels that delivered to them and representatives of catcher-processors, motherships, and vessels from whom they received deliveries (Herrick et al. 1994; NPFMC 1992a). Also, the excess capacity led to a cycle of bankruptcies and recapitalizations of fishing vessels and catcher-processor vessels (Strong and Criddle 2013). The open-access character of the BSAI pollock fishery ended in 1998 with the passage of the American Fisheries Act (AFA). The AFA established a permanent moratorium on new vessels entering the fishery and assigned each sector a permanent share of the BSAI pollock TAC. Also, the Act provided for the buyout of nine of the 29 catcher-processor vessels that were then active in the fishery and allowed each sector to subdivide catch shares among its vessels.

BSAI Pollock Fishery Management

The American Fishery Act (AFA) established a moratorium on entry into the BSAI pollock fishery, authorized the formation of fishing cooperatives, and established a permanent allocation of the BSAI pollock TAC among sectors and to the Western Alaska Community Development Quota (CDQ) program (AFA 1998). Ten-percent of the BSAI pollock TAC is allocated to the CDQ program. The remainder (90%) of the BSAI pollock TAC, minus a small reserve for management uncertainty, is allocated 50% to the inshore sector (catcher vessels delivering to onshore processors), 40% to the offshore (catcher processors), and 10% to catcher vessels that deliver to motherships (AFA 1998; Strong and Criddle 2013). Harvests of BSAI pollock in 2017 are reported in Figure 4.4 for each sector.

The AFA also contained other significant provisions, including minimum U.S. ownership requirements applicable in all U.S. fisheries, a permit/vessel buyout, a listing of qualified vessels, processer eligibility requirements, revised sector allocations, provisions for fishery cooperatives, and sideboard provisions. For the

inshore sector, eligible processing plants and catcher vessels were defined based on catch or processing history, and a total of 111 catcher vessels and eight processing plants qualified. The AFA specifies that pollock taken in the inshore sector's directed fishery can only be taken by qualified vessels and delivered to qualified processing plants. These vessels are collectively called the AFA catcher vessel fleet (Strong and Criddle 2013).

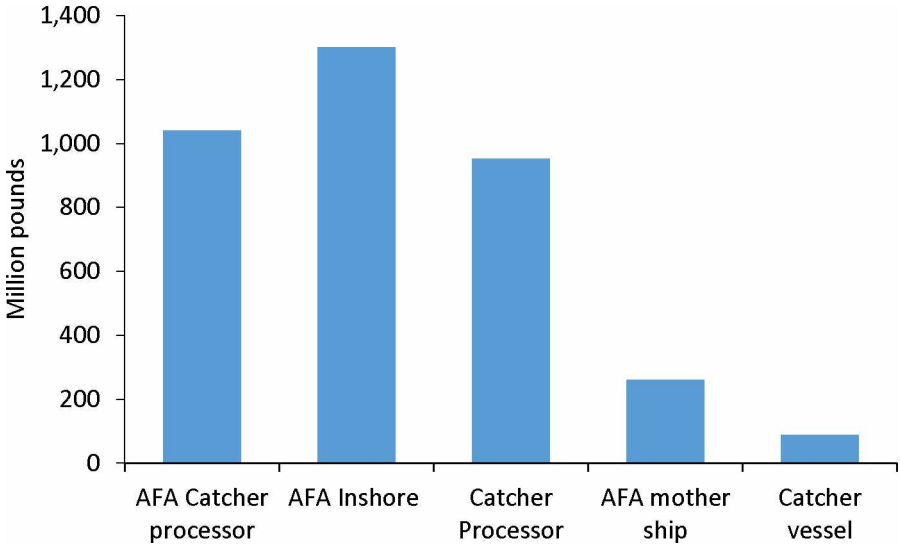

Figure 4.4. Amount of pollock (million pounds) caught in the BSAI pollock fishery, by sector in 2018.

The transformation of a fishery from open-access to a catch share management system often leads to reductions in the number of active fishing vessels and can lead to concentration of QS ownership. The contraction of fleet numbers in the pollock fishery occurred in two phases. In the first phase, the AFA engineered a buyout of nine catcher-processors and reallocated a portion of their catch history to the inshore sector. The second phase occurred within sectors as firms mothballed some of their vessels to increase the fishing efficiency of their remaining vessels, and as profitable firms bought QS from less profitable firms.

Geographic Distribution of Pollock fishery QS holders

Ownership of the QS for catcher-processors is mostly held by companies based in the Puget Sound region.

- The AFA Catcher Processor fleet has 20 members: one based in Alaska and the rest in Washington State.
- All of the AFA inshore processors are based in Washington State.
- The three AFA motherships are based in Washington State.
- AFA catcher vessels that deliver to inshore processors or motherships are mostly based in Seattle (60%), with 24% in Alaska and 16% in Oregon.

The vessels that are qualified to fish for the AFA fishery are updated automatically and listed on the NOAA website (NOAA 2019).

Homeports of BSAI Pollock Fishing Vessels

A majority of the BSAI pollock fleet is homeported in Washington, with a small portion in Alaska and the remainder in Oregon (Figure 4.5).

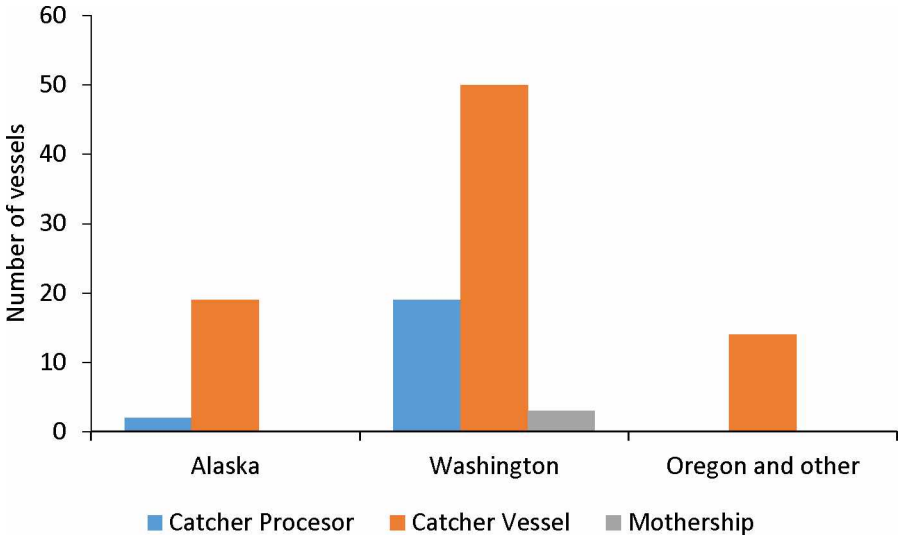

Figure 4.5. The geographic concentration of the AFA vessels by vessel category and homeport, 2018.

While many of these vessels purchase support services in the port communities where they deliver their catch, most rely on the more extensive capabilities of shipyards in Washington and Oregon for major services and annual maintenance.

Economics of the BSAI Pollock Fishery

The BSAI pollock fishery is among the largest in the world, with an annual harvest of 3.38 million pounds caught on a sustainable basis. In 2017, the BSAI pollock fishery was worth $413 million gross exvessel value (NMFS 2018). In 2017, landings from this fishery represented 28% of the total volume and 17% of the total value of fish caught by the U.S. (NMFS 2018). The AFA sectors formed cooperatives and subdivided the sector allocation among qualified vessels, thereby eliminating the race for fish, which allowed them to improve their targeting, increase their product recovery rate (Felthoven 2002), and transition to higher-valued products (Strong and Criddle 2013). Revenue per active pollock vessel increased by 114% from 1999 to 2004 (from $1.8 million to $3.5 million per vessel (Brinson 2013). The revenue per vessel decreased to $2.2 million in 2010 (Brinson 2013). In 2018, the revenue per AFA vessel was estimated at $3.5 million.

The main products of the pollock fishery are roe and surimi for the Japanese market and fillets for the U.S. market, but the global market has expanded to allow the product flow to expand into new domestic and international markets in Europe and other areas (Strong and Criddle 2013). AFA pollock catcher vessels deliver

whole fish to the processing plants, who then convert the raw fish into fillets, surimi, roe, fish oil, minced fish, and fishmeal. The catcher vessel fleet delivered 90% of its pollock catch to Dutch Harbor and Akutan.

The AFA significantly altered the BSAI pollock fishery by allowing the formation of harvesting and processing cooperatives and defining exclusive fishing rights. Results from multi-input, multi-output models indicate that fishing capacity fell by more than 30% and that technical harvesting efficiency and the capacity utilization measures increased relative to past years (Felthoven 2002).
The management changes in the AFA caused significant structural change to the price response (Fell 2008). The fishery had significant growth in economic productivity and the higher revenue, which suggests that the move to rights-based management has significantly increased the economic performance in the pollock fishery (Morrison-Paul et al. 2009).

The increased value came about because freedom from the race for fish allowed fishers and processors to increase product quality, improve product recovery rates, diversify their mix of product forms, and develop new markets in the USA and Europe (Strong and Criddle 2013). In contrast to the salmon or halibut fisheries with ties to coastal communities throughout Alaska, the pollock fleet is primarily based out of the Pacific Northwest, and shore-based processing of the pollock takes place primarily in Dutch Harbor/Unalaska and Akutan, with small amounts of BSAI pollock landed and processed in Sand Point, Adak, and Kodiak. However, the pollock fishery also has a significant financial footprint throughout Western Alaska through the CDQ program.

Crab Fisheries

Crab fisheries occur in state and federal waters off Alaska from Southeast Alaska to Northwest Alaska. Dungeness crab fisheries are mostly confined to state waters and are managed under state LEP programs. Fisheries for hair crab, king crab, snow crab, and Tanner crab occur in state and federal waters. Figure 4.6 represents the boom-and-bust pattern of catches in the major crab fisheries off Alaska. In Southeast Alaska and across the Eastern and Central GOA, management of crab fisheries is delegated to the state, which issues LEPs. The state and federal governments jointly manage crab fisheries in the BSAI. In the BSAI, the state issues LEPs for nearshore crab fisheries and minor species, while the federal government oversees six crab stocks (Bristol Bay red king crab, Bering Sea Tanner crab, Bering Sea snow crab, St. Matthew Island blue king crab, and Pribilof Islands red and blue king crabs). Those six fisheries are the primary focus of this section.

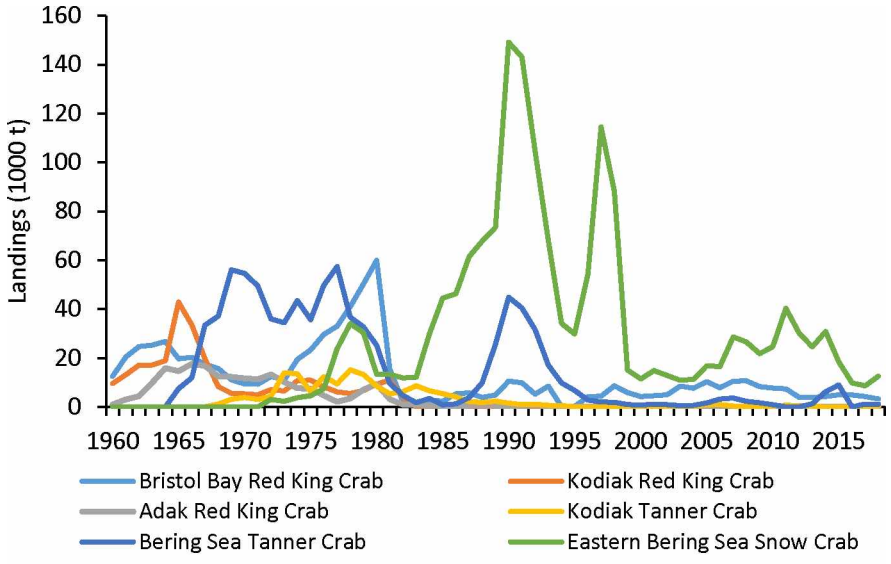

Figure 4.6. Landings in major crab fisheries off Alaska, 1960-2018 (Foster 2019).

In the immediate aftermath of MSA implementation, the NPFMC deferred the management of BSAI crab fisheries to the State of Alaska. The state relied on annual GHLs and size-season-sex regulations to guard against overharvesting. In response to unmanageable increases in the number of crab fishing vessels, the state implemented an LEP program. However, limiting the number of vessels failed to stop the race-for-catch from intensifying as fishermen replaced small vessels with larger vessels and carried ever-increasing numbers of crab pots. Limits on the number of crab pots per LEP also failed to slow the race-for-catch and the ensuing dangerous fishing practices (Greenberg and Herrmann 1994; Herrmann et al. 1998). Vessels that waited out winter storms in safe harbor lost fishing days while some of those that went to sea despite dangerous weather conditions lost their lives; BSAI crab fishery saw 80 fatalities between 1991 and 2005 (Pfeiffer and Gratz 2016).

Moreover, each of these state management efforts needed to be paired with complementary action by the NPFMC, something that became increasingly difficult to achieve. In the mid-1990s, the state yielded responsibility for BSAI crab fisheries management to the NPFMC but retained a role in stock assessment and in-season management. In 2005, the NPFMC adopted a catch share program for BSAI crab fisheries that included IFQ issued to vessel owners and skippers, and Individual Processor Quota (IPQ) issued to processors.[4]

[4] In this chapter, the acronyms IFQ and QS (quota shares) will be used interchangeably to denote the long-term privilege to harvest a share (percentage) of the TAC or the annual realization (pounds) of that privilege. Similarly, IPQ and PQS (processor quota shares) will be used interchangeably. The specific meaning of these terms in U.S. regulation, where QS and PQS denote the long-term use right and IFQ and IPQ denote the annual realization of the use right, is contrary to the usage of these terms in scholarly publications and other world fisheries.

Ninety-percent of the QS (class A shares) associated with IFQ must be delivered to a processor who holds processor quota shares (PQS), the annual realization of their IPQ. The remaining QS (class B shares) can be delivered to any processor. The amount and type of QS initially issued depended on the vessel catch history during specific qualifying years.

BSAI Crab Fisheries under IFQ and IPQ Management

The BSAI crab fisheries are managed under an FMP that outlines a harvest control rule that adjusts Acceptable Biological Catch (ABC) according to estimates of current and future stock abundance. The NPFMC sets an annual TAC for each fishery at or below the ABC. The NMFS is responsible for monitoring catch to ensure that the TAC and individual QS are not exceeded. The total tonnage of commercial landings of BSAI cab was 64.03 million pounds in 2016.

The BSAI crab FMP covers nine stocks: Bristol Bay red king crab, Bering Sea snow crab, Eastern Bering Sea Tanner crab, Western Bering Sea Tanner crab, Eastern Aleutian Islands golden king crab, Pribilof Islands red and Pribilof Islands blue king crab, St. Mathews Island blue king crab, Western Aleutian Islands golden king crab, and Western Aleutian Islands red king crab. Four of these fisheries have remained closed for more than a decade. The five crab fisheries open during 2018 were the Bristol Bay red king crab, Bering Sea snow crab, Eastern Bering Sea Tanner crab, Western Aleutian Islands red king crab, and Western Bering Sea Tanner crab fisheries. Figure 4.7 shows the crab catch history by fishery over the past 27 years (NOAA 2019b).

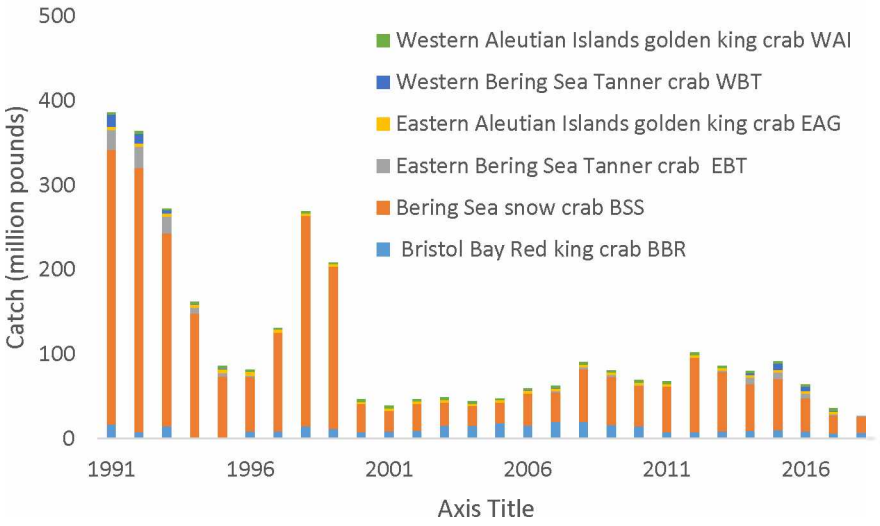

Figure 4.7. Total landings, by fishery, in BSAI crab fisheries, 1991-2018.

Geographic Distribution of BSAI Crab QS Ownership

Ownership of BSAI crab QS reflects the high historical participation of Pacific Northwest fishermen. Residents of Washington currently hold 56% of the crab QS, and Oregon residents currently hold 12% of the crab QS, while Alaska residents currently hold 28% of the crab QS. Within Alaska, BSAI crab QS ownership is broadly distributed, reflecting, in part, allocations among the CDQ entities and the historical participation of fishermen from Kodiak, Homer, and Southeast Alaska.

Homeports of BSAI Crab Fishing Vessels

Although a majority of the BSAI crab fishing fleet is homeported in the Pacific Northwest, nearly 48% of the fleet is homeported in Alaska (Figure 4.8). Although BSAI crab fishing vessels are large, they are not as large as vessels engaged in the BSAI pollock fishery, and many can secure needed port services in Alaska (NPFMC 2017).

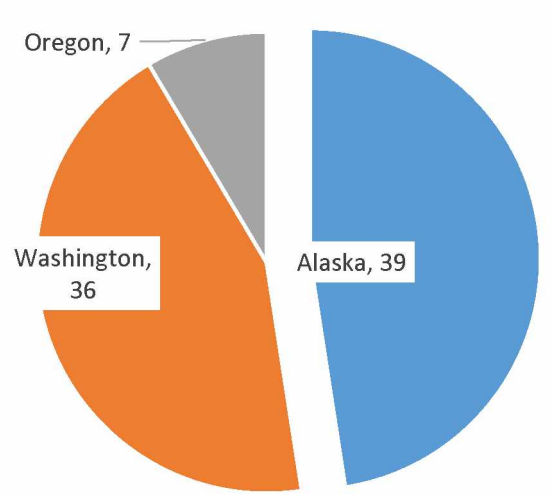

Figure 4.8. The geographic concentration of the BSAI crab fishing vessels (numbers) by vessel homeport, 2019.

The port of Kodiak has added infrastructure to allow the crab vessels to conduct most of their maintenance and repairs in Kodiak. Consequently, many crab vessels stay in Kodiak unless they need significant work done; then, the owners run the boats to Seattle. Many of the crew and skippers fly into Kodiak and take the boats to the grounds for the season (Freed 2019).

Consolidation of the BSAI crab fleet in the wake of catch share program implementation was more rapid and more extreme than consolidation in the pollock fishery following the AFA. It was also more rapid and more extreme than the consolidation that occurred in the halibut and sablefish fisheries following the adoption of IFQs. Figure 4.9 depicts time series observations of vessel participation numbers in eight BSAI crab fisheries.

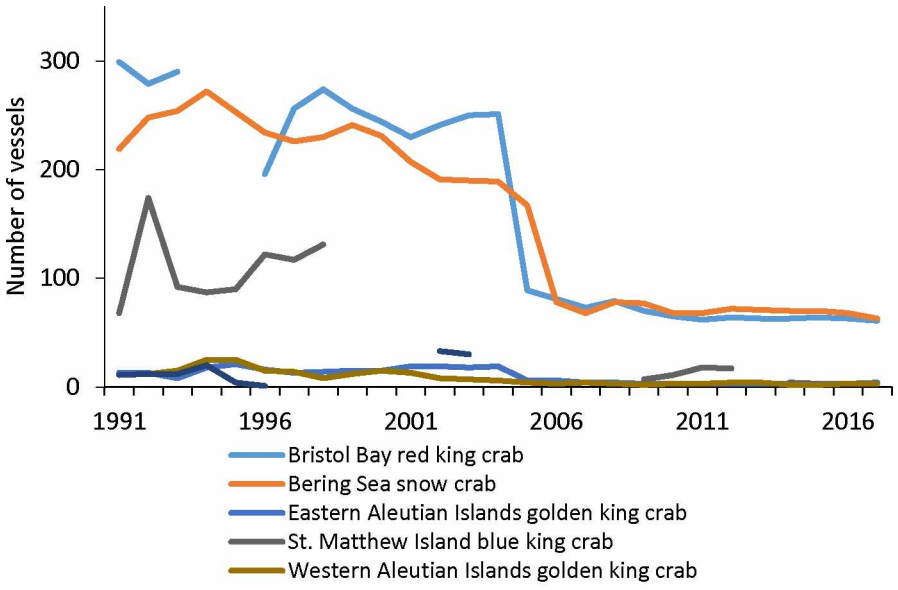

Figure 4. 9. The number of vessels fishing for crab, by fishery, 1991-2018. The dashed vertical line denotes the implementation of the BSAI crab IFQ program.

Between the 2004/2005 and the 2005/2006 seasons, the initiation of the IFQ program, the BSAI crab fishing fleet shrank from 280 vessels to 89 vessels (NPFMC 2008). Consolidation of the fleet had been anticipated in the regulatory review documents, but the pace and the extent of consolidation had not been anticipated (NMFS 2004). In retrospect, the severe contraction of the fleet has been attributed to a combination of factors including the anticipated continued decline in crab stocks, the expansion of Russian exports of red king crab, and expansions in Canadian and Norwegian harvests of snow crab (NPFMC 2008; Criddle 2012). Consolidation can reduce the number of crew positions as vessel owners who received little QS sell to those who qualified for larger amounts of QS. Initial, naïve, reviews of the outcomes of program implementation imagined dire consequences for crew compensation and communities (NPFMC 2008). Subsequent rigorous analyses determined that crew compensation rose for full-time crew as part-time positions were eliminated (Abbott et al. 2010; Lazarus et al. 2011). The crab program included a unique provision that specified an arbitration process for settling exvessel prices between IFQ and IPQ interests. It is unclear how that process has affected the distribution of profits between IFQ and IPQ holders, but some analysts have found evidence that the program resulted in a shift of profits from processors to fishermen (Matulich 2008; Matulich 2009). In addition, there is evidence that despite community protection measures, program implementation reduced economic activity in some communities (Kasperski et al. 2016; Knapp and Lowe 2007; Knapp 2006).

Economics of the BSAI Crab Fisheries

BSAI crab fisheries compete for a share of the global market for crab (Herrmann and Greenberg 2007; Greenberg et al. 1995). The gross exvessel value of the BSAI crab fisheries has averaged $205 million since the initiation of the BSAI crab IFQ program in 2005 (Figure 4.10).

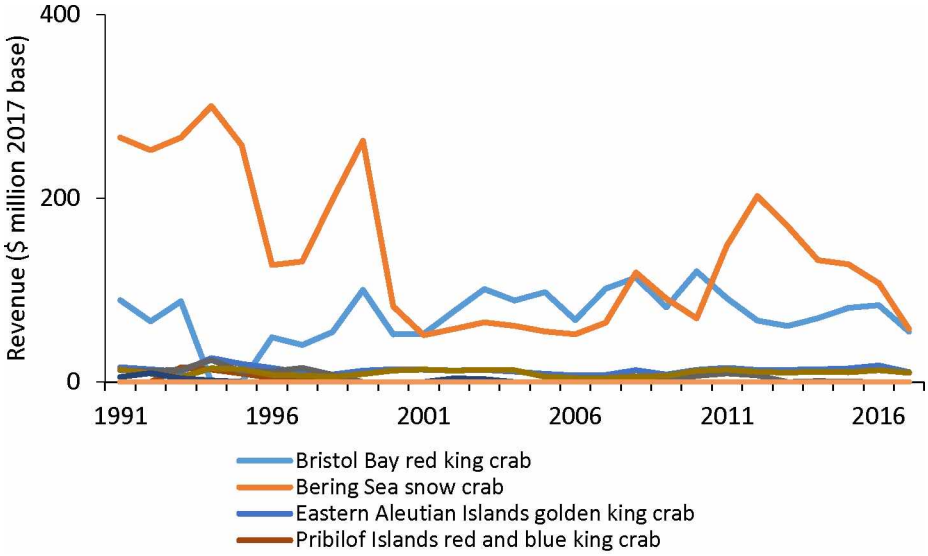

Figure 4.10. Exvessel revenues nominal value ($ million) in the BSAI crab fishery from the 1991 season through the 2016/2017 season (Garber–Yonts and Lee 2017).

Revenue per crab vessel grew by 100% between 1995 and 2005/06 to $1.4 million per vessel (Brinson 2013). The average revenue per crab vessel between 2007/08 and 2013/14 was $2.4 million per boat (Garber –Yonts and Lee 2017). The highest year per crab vessel was the season of 2010/11 of $3.1 million per vessel (Brinson 2013).

In 2018, BSAI crab were caught by an active fleet of approximately 118 vessels and landed and processed at 12 processing facilities, the fewest active processing plants since IFQ implementation. Total finished pounds reported by processors in 2016 across all FMP crab species and product forms were 42.3 million pounds, with an estimated first wholesale value of $349 million (Garber–Yonts and Lee 2017). In 2016, the fishery supported 1,218 fishing crew positions on 89 active vessels, with labor share earnings totaling $36.3 million paid to deck crew and $16 million to captains (Garber-Yonts and Lee 2017). Processing for the first wholesale market is estimated to have accounted for some 788 thousand hours of line labor in 2016, generating $9.84 million in wages (Garber-Yonts and Lee 2017)). BSAI crab harvests in 2016 represented 0.56 percent of the total volume of U.S. commercial seafood landings, but accounted for 3.5 percent of total ex-vessel value; with respect to Alaska alone, these fisheries account for 0.97 percent of total catch volume and 11.9 percent of total ex-vessel value produced in commercial fisheries of Alaska (NMFS 2017).

Communities with crab fleets changed following the implementation of IFQ and IPQ. The amount of crab harvested by fishermen and fishing vessels based in smaller communities in Alaska has declined while the amount delivered to larger communities such as Anchorage and Homer and outside Alaska has increased (Kasperski et al. 2016). There are some requirements that processors give the communities first refusal rights if the communities are interested in purchasing quota. However, this has occurred only twice, first with Kodiak (represented by Kodiak Fisheries Development Association) and then with King Cove/Sand Point (represented by Aleutia, Inc.). In most cases, the communities find it uneconomic to secure funds needed to buy the processing quotas.

Halibut and Sablefish Commercial Fisheries

The commercial fisheries for Pacific halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria*) off British Columbia and Alaska began in the late 19th and early 20th century. During the 1960s and early 1970s, foreign, distant water fleets exerted unsustainable pressure on both stocks outside of U.S. and Canadian territorial waters. Soon after the U.S. and Canada declared extended jurisdiction in the mid-1970s, foreign fleets were excluded from both fisheries, the stocks recovered, and the domestic fleets expanded. The race-for-fish intensified in both fisheries in the 1980s with season openers in some areas collapsing to as few as 48 hours in the halibut fishery. After many public meetings and extensive analysis of alternatives, the NPFMC approved the Alaska halibut and sablefish IFQ program in late 1991 for initial implementation at the start of 1995 (Pautzke and Oliver 1997). IFQ-based management in the sablefish and halibut fisheries had proponents and opponents who argued their viewpoints before the NPFMC and in the courts. Ultimately, the program was approved (NPFMC 1992b) and weathered legal challenges (ADOL 1995; *Alliance Against IFQs v. Brown* 1996). The IFQ program was intended to increase the manageability of these fisheries and reduce overharvests while minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, and preserving the owner-operator character of the fishery (Pautzke and Oliver 1997). The Alaska halibut and sablefish program IFQ was implemented in 1995, at a time when fishing communities were beginning to struggle with the collapse of salmon exvessel prices (Herrmann 1994; Herrmann 1992). In structuring the program, the NPFMC included rules intended to limit the extent of consolidation of QS ownership, to maintain diversity in the size of vessels used to fish halibut or sablefish IFQ, and to keep QS in the hands of individuals onboard fishing vessels (NPFMC 1992b; Terry 1993; NOAA 2012). The halibut and sablefish IFQ program was successful in keeping the general structure of the fleet through owner-onboard requirements for QS holders and limits on the transfer of QS between vessel size classes (NPFMC 2016; Kotlarov 2018). However, concern has been raised over the overall shift of halibut and sablefish QS from some coastal communities (Carothers et al. 2010).

An Overview of the Halibut Fishery

The halibut fishery had high catches over 100 years ago (between 1911 and 1915), with average landings of 64.3 million pounds (Bell 1981). By the 1960s, halibut stocks were thought to be in decline, leading the IPHC to reduce catch limits (Bell 1970). However, because halibut prices continued to increase, more small vessels were attracted to this fishery from the salmon fishery, which had transitioned to limited entry in the early 1970s (Hartley and Fina 2001). Commercial halibut landings dropped substantially between 1961 and 1976, from about 70 million pounds to 27 million pounds (Figure 4.11). Once the fishery was Americanized in 1976, the halibut stock started to rebuild, and more U.S. flagged vessels entered the fishery. Under the Northern Pacific Halibut Act of 1982 (Public Law 97- 176 1979), the NPFMC is authorized to develop regulations that are in addition to, but not in conflict with, the regulations adopted by the IPHC. The NPFMC develops limited entry regulations and allocations for Alaska portions of the commercial and charter halibut fishery as well as the regulations for subsistence use. The NMFS is responsible for developing, implementing, and enforcing regulations for the management of halibut fisheries within the United States territorial seas and Exclusive Economic Zone. The halibut fishery again increased until 2004 when it started to decline to current levels (Figure 4.11). Halibut removals have declined substantially because of management measures intended to address concerns about declines in exploitable halibut.

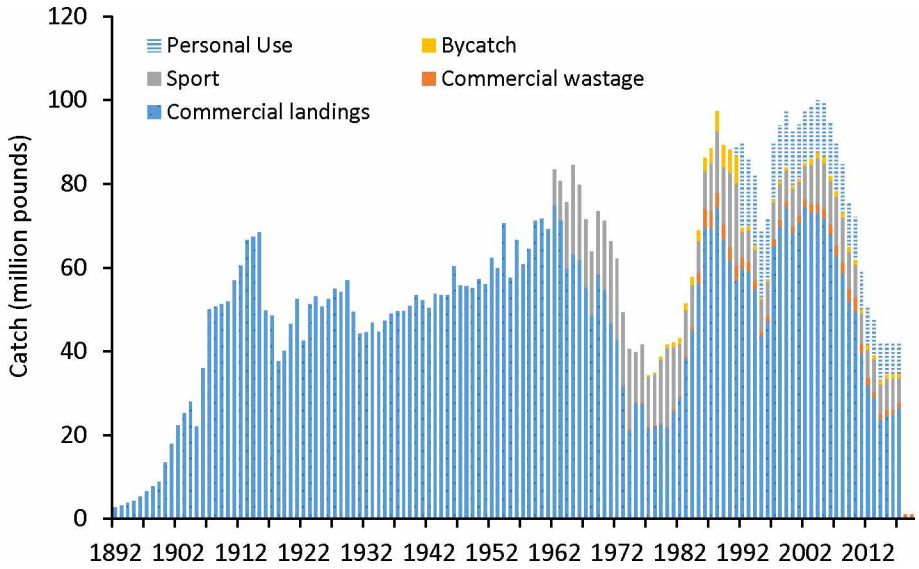

Figure 4.11. Total commercial catch (million pounds) of halibut by different sectors, 1892-2018. (The mid-1970s are highlighted in red to denote the years leading up to and following the declaration of the 200-mile Exclusive Economic Zone.)

In recent years, halibut exploitable biomass and sustainable catch limits have declined. These declines have been attributed to several factors. First, over the past 40 years, the average size-at-age halibut has decreased

(IPHC 2016). For example, in 1997, a typical 14-year-old halibut weighed 55 pounds, while the same age halibut in 2014 averaged 25 pounds (Holsman et al. 2018). Second, the halibut fishery has five competing sectors: commercial fishing for halibut; non-guided and guided (charter) sport fishing; subsistence (personal use) fishing; incidental catch of halibut in other commercial fisheries; and wastage, the mortality (dead loss) of undersized halibut discarded by the commercial halibut and sablefish fisheries. Also, there have been changes in how the IPHC calculates biomass that lowered the quota in some regions.

An Overview of the Sablefish Fishery

The sablefish fishery developed as a secondary activity for fishermen participating in the United States and Canadian halibut fisheries. The sablefish fishery started in waters off Washington and British Columbia and, by the 1920s, extended along the Pacific coast from Northern California to Kodiak (Hanselman et al. 2017). In contrast to the halibut fishery, until 1978, sablefish were caught primarily by foreign fishing vessels (Berger et al. 1986). The first domestic, commercial landings in Alaska from this fishery were in 1958. In the mid-1960s, the fishery expanded along the Aleutian Island chain and into the Eastern Bering Sea (EBS), where Japanese longline catches peaked at almost 52 million pounds in 1966. In addition, sablefish bycatch in other foreign fisheries off Alaska reportedly averaged 9.4 million pounds. In the late 1960s, as EBS catches declined, Japanese fishermen switched their focus to the GOA, where sablefish catches in the Japanese longline fishery peaked at 145 million pounds in 1972 (Figure 4.12).

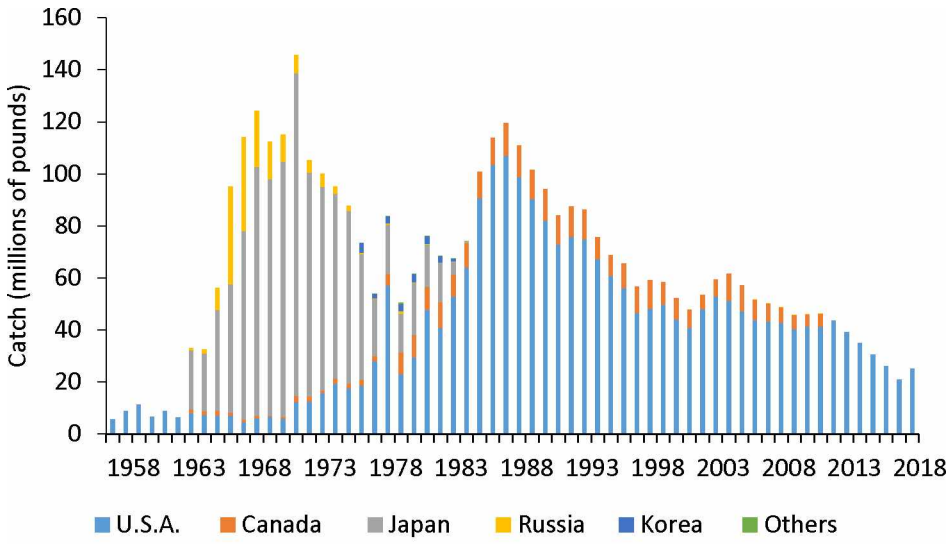

Figure 4.12. Sablefish landings (million pounds) by nation, 1958-2018. The beginning of extended jurisdiction was in 1976.

Heavy fishing by foreign vessels during the 1970s led to a substantial decline in sablefish biomass (Hanselman et al. 2017). Limits were put on the expanding Japanese trawl fisheries inside the 12-mile United States territorial seas to stem excessive catches, but those limits did not apply outside United States waters (Sonu 2014). With the implementation of the FCMA in 1976, the NPFMC gained authority over 200-mile FCZ off Alaska and quickly curtailed excessive foreign catches (Hanselman et al. 2017). The substantial drop in sablefish catch since the late 1980s has been attributed to declines in growth (Echave et al. 2012), declines in recruitment success (Shotwell et al. 2014; Schirripa and Colbert 2006), and the impact of whale depredation on hooked sablefish (Petersen et al. 2014; Sigler et al. 2008; Hanselman et al. 2014).

Because the sablefish fishery was mostly a foreign fishery until the mid-1980s and because the fishery occurs in deeper offshore waters fished by larger vessels, the roots of the sablefish fishery are not as deeply embedded in small Alaskan communities. Nevertheless, the fishery quickly became a valuable fishery that could be pursued by small or large vessels, and, as in the halibut fishery, effort surged in the 1980s, and the ensuing race-for-fish led to ever-shorter fishing seasons.

There are four vessel classes in the IFQ halibut for QS (A-D) and the three classes of sablefish QS (A-C). Class A shares in both fisheries are designated for freezer processor vessels and are not associated with a vessel restriction. In both fisheries, Class B shares were designed to be fished on a vessel ≥60 feet, but later amendments allowed the Class B shares to be fished on all size vessels. Class C shares were designed to be fished on vessels from 35 feet to 60 feet but have been amended to allow fishing on any vessel <60 feet. Class D shares in the halibut fishery were designed to be fished on vessels less than 35 feet in length and were introduced to protect small vessel operators. Class D quota shares were not introduced in the sablefish fishery because very few small vessels had participated in the sablefish fishery, which takes place in deep offshore waters more exposed to inclement weather.

Management of the sablefish IFQ fishery is shared by the state of Alaska and the federal government. Sablefish are assessed as a single stock with harvest limits apportioned between regions and between state and federal waters based on the distribution of relative abundance. The ABC and Overfishing Level (OFL) are set by the NPFMC Scientific and Statistical Committee (SSC) based on recommendations from stock assessment scientists and Plan Teams. The NPFMC recommends, and the U.S. Secretary of Commerce approves, an annual TAC below the ABC (Hanselman et al. 2017). The TAC is also apportioned among gear groups, longline, pot, and trawl in federal waters, and longline, pot, trawl, jig, and troll gear in state waters. Sablefish are also taken as bycatch, particularly in trawl fisheries and in the halibut fishery. There is some recreational and subsistence fishing for sablefish but nowhere near the level of halibut. Sablefish are typically landed and processed in

Alaskan ports, but a small portion of the TAC is allocated to catcher-processor vessels (NPFMC 1989). State LEP fisheries for sablefish occur in Southeast Alaska, Prince William Sound, and in other State waters.

Geographic Distribution of the Halibut Fleet:

Ownership of halibut QS reflects the high historical participation of Alaska residents. In 2018, 75% of the halibut QS holders were Alaskan residents, 16% were residents of Washington, 4% were Oregon residents, and 5% were residents of other states (NOAA 2014). Alaska, by volume of the QS units, has 62 percent of the total QS units, with 25% of the volume of QS units belonging to residents of Washington, and the rest is distributed through the other states (NOAA 2014).

In Areas 2C, 3A, 3B, 4A, and 4C, most IFQ permit holders with landings use QS owned by Alaska residents. Quota share owners from Alaska were also credited with the most pounds landed in Areas 2C, 3A, and 4C in the 1995 through 2014 fishing seasons. In Areas 4B and 4D, the most permit holders with landings used QS owned by persons from Washington. Quota share owners from states other than Alaska or Washington were credited with relatively small amounts of the landings (NOAA 2015a). The change in percentage of Alaskan ownership of halibut QS from 1995 to 2019 is displayed in Figure 4.13.

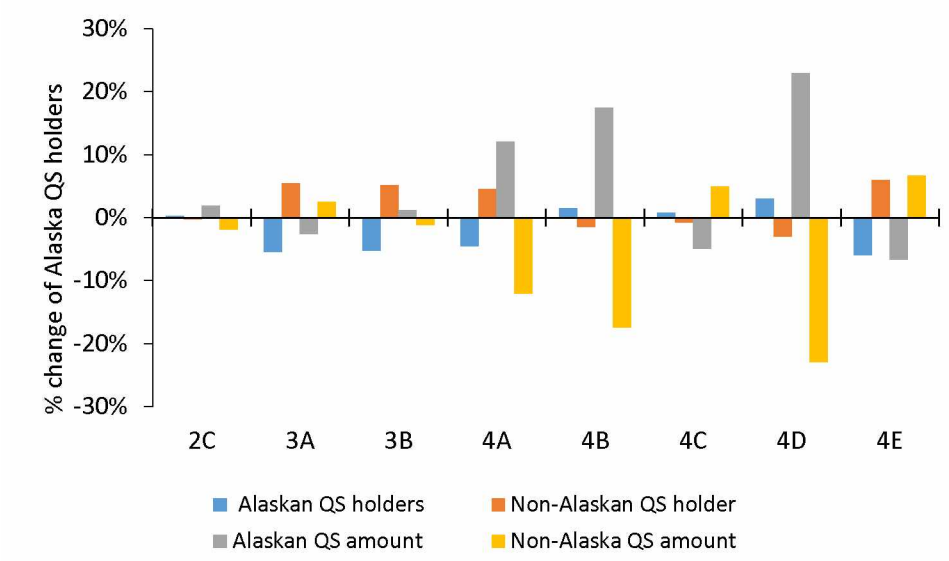

Figure 4.13. Changes in halibut QS ownership by Alaska residents and non-residents, 1995-2019 (NOAA 2019d).

The ratio of Alaskan to non-Alaskan holders of quota share has stayed the same in Area 2C, while it has declined in Areas 3A, 3B, 4A, and 4E. The amount of QS owned by Alaskans increased the most in Areas 4A, 4D, and 4B and increased slightly in Areas 2C and 3B. The amount QS held by non-residents increased in Areas 3A, 4C, and 4E. Within Alaska, halibut QS ownership is broadly distributed, reflecting, in part,

allocations among the CDQ entities and the historical participation of fishermen from Kodiak, Southcentral Alaska, and Southeast Alaska. Looking at the ownership of QS by rural and urban areas (Figure 4.14), there is an apparent change within Alaska ownership (rural, urban) of halibut QS over time shown in Area 2C (NOAA 2015a).

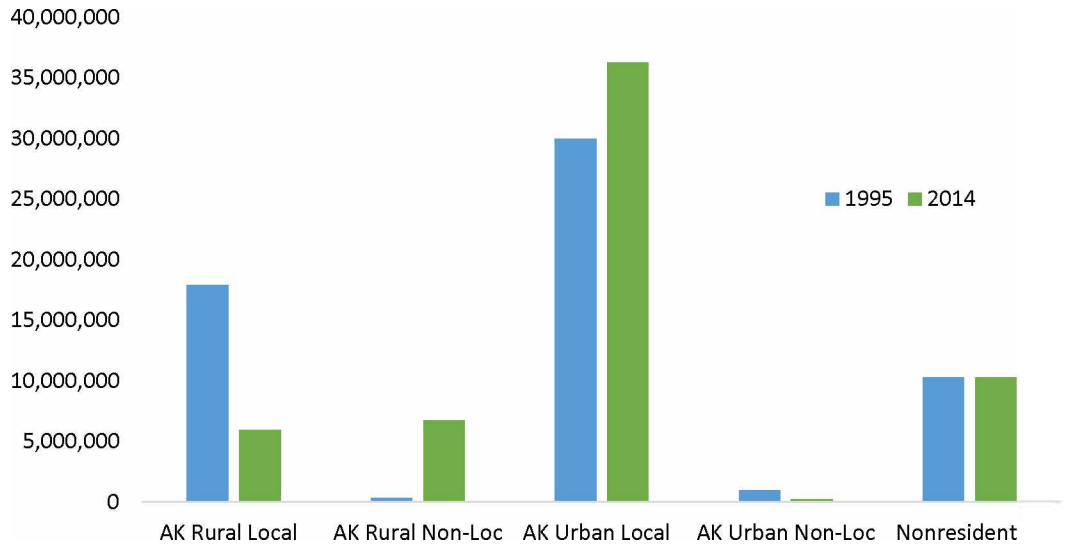

Figure 4.14. Halibut quota share ownership by rural and non-rural residents, Area 2C, 1995-2014 (NOAA 2015).

Numbers of Vessels Active in the Halibut Fishery:

The number of vessels engaged in the halibut fishery has declined in all IPHC major regulatory areas off Alaska, with the most significant declines occurring between 1994, the last year of open-access fishing, and 1995, the first year of the IFQ fishery (Figure 4.15) (NOAA 2012 updated).

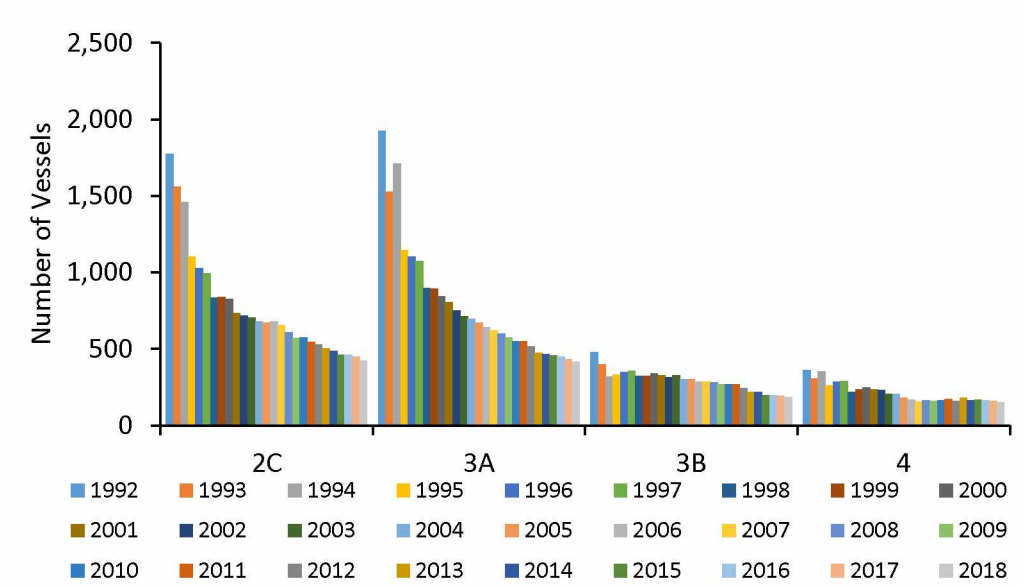

Figure 4.15. Number of vessels fishing for halibut by IPHC major regulatory area, 1992-2018.

The highest number of vessels that fish for halibut is located in Southeast Alaska (2C), followed by the Central Gulf of Alaska (3A), with fewer vessels in the Western Gulf of Alaska, the Bering Sea, and the Aleutian Islands.

Homeports of Halibut Fishing Vessels

Where fishermen keep their vessels often differs from where they reside. In 2018, most active halibut fishing vessels were homeported in Alaska (769); 37 were homeported in Washington, and ten were homeported in Oregon (Figure 4.16).

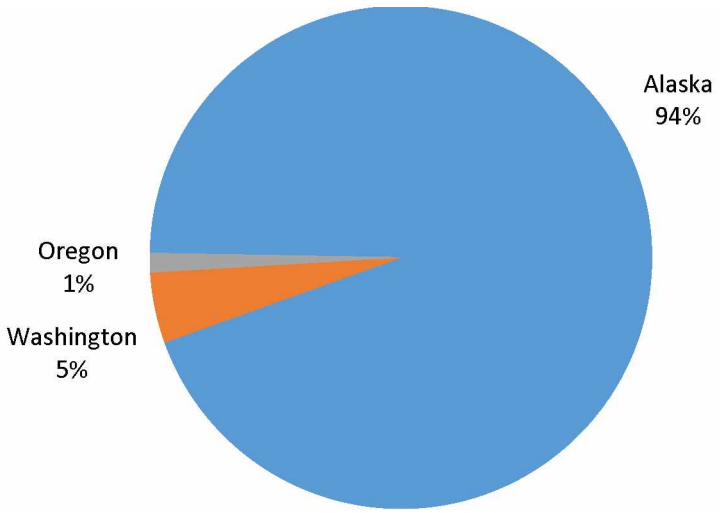

Figure 4.16. Number of halibut vessels by homeport state.

The top three ports for halibut landings account for 40% of total landings (Figure 4.17). All of the top 10 halibut landing ports are located in Alaska and, together, account for 79% of all halibut landings (Figure 4.17).

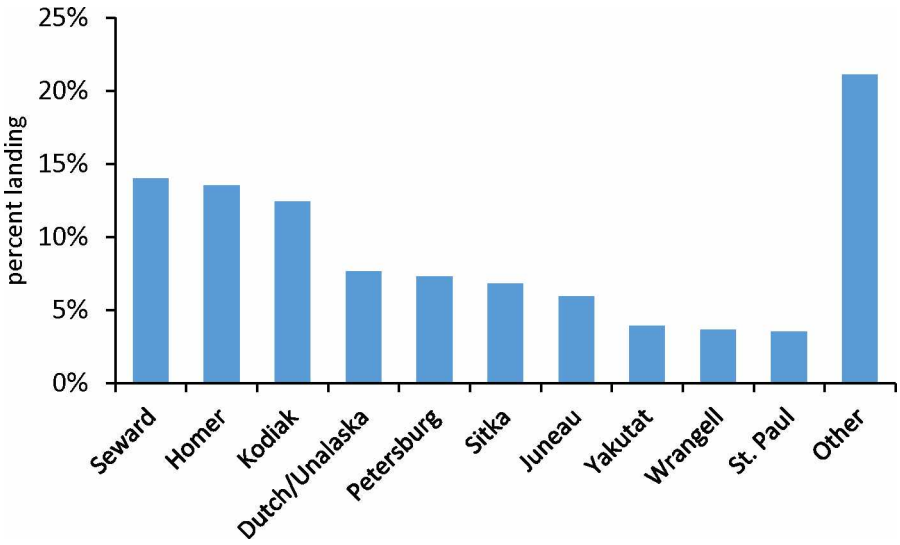

Figure 4.17. Percent of total halibut landings by port in 2018.

Geographic Distribution of the Sablefish Fleet:

Ownership of sablefish QS reflects the high historical participation of Pacific Northwest fishermen. Residents of Alaska currently hold 59% of the sablefish QS, Washington residents hold 31%, Oregon residents hold 4%, while about 6% is held by residents of other states (NOAA 2014). Sablefish QS ownership was highest for Alaska residents in Southeast Alaska, Yakutat, and the Central Gulf of Alaska management areas. Alaska residents who own sablefish quota shares were also credited with the most pounds landed in those areas. Washington residents had the highest share of sablefish quota share ownership in the Western Gulf of Alaska, Bering Sea, and Aleutian Islands management areas. Residents of other states account for a small amount of sablefish quota share ownership and landings (NOAA 2015b). The change in percentage Alaskan ownership of sablefish QS from 1995 to 2019 is displayed in Figure 4.18.

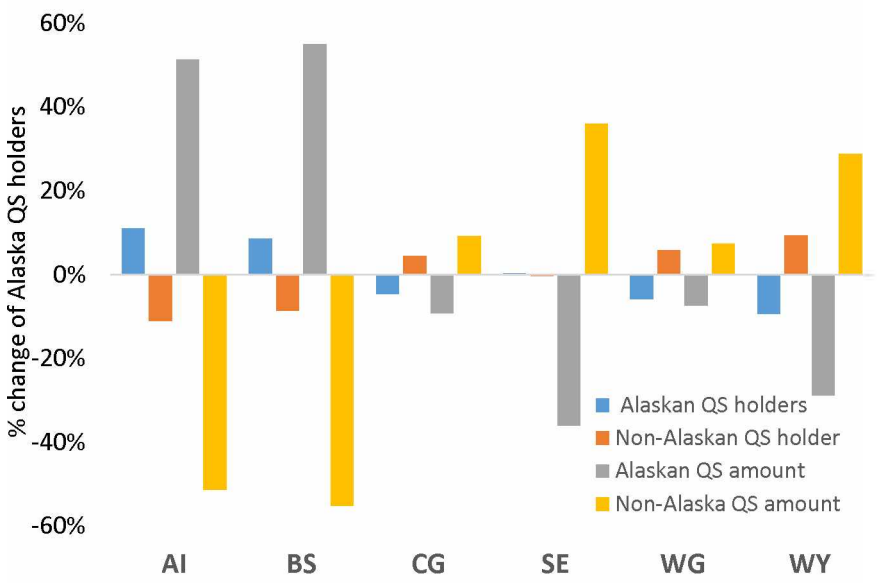

Figure 4.18. Changes in sablefish QS ownership by Alaska residents and non-residents, 1995-2019 (NOAA 2019d).

Alaskan ownership of sablefish QS in the Bering Sea and AI regions increased substantially from program implementation in 1995 through 2019. The number of Alaskans QS holders also increased the most in AI and BS and decreased the most in WY and WG. The amount of QS held increased decreased for Alaskans the most in SE and WY, which saw an increase to Nonresidents in these areas. Within Alaska, sablefish QS ownership is broadly distributed, reflecting, in part, allocations among the CDQ entities and the historical participation of fishermen from Kodiak, Southcentral Alaska, and Southeast Alaska. The highest percentage of QS held by Alaskans is held by residents in Southeast Alaska and the Central Gulf of Alaska. The change in rural versus urban ownership of sablefish QS from 1995 through 2014, is shown in Figure 4.19 (NOAA 2015a).

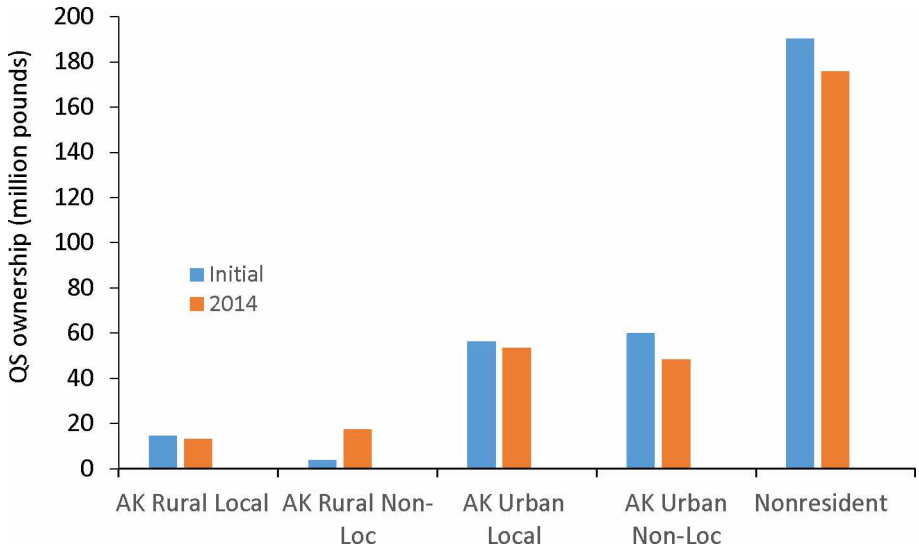

Figure 4.19. Changes in the geographic concentration of sablefish QS ownership between rural and urban areas, 1995-2014 (NOAA 2014).

Most of the sablefish QS is owned by nonresidents, with 58% of the total amount being initially allocated. In 2019, the total amount of sablefish QS held by Alaskan residents is 42%, and the total amount of QS held by nonresidents is 57%, a one percent decrease since 2018 (NOAA 2015a).

Numbers Vessels Active in the Sablefish Fishery:

The number of vessels engaged in the sablefish fishery has declined in all major regulatory areas off Alaska (Figure 4.20). The most significant declines occurred between 1994, the last year of open-access fishing, and 1995, the first year of the IFQ fishery (RTF 2012 RAM request).

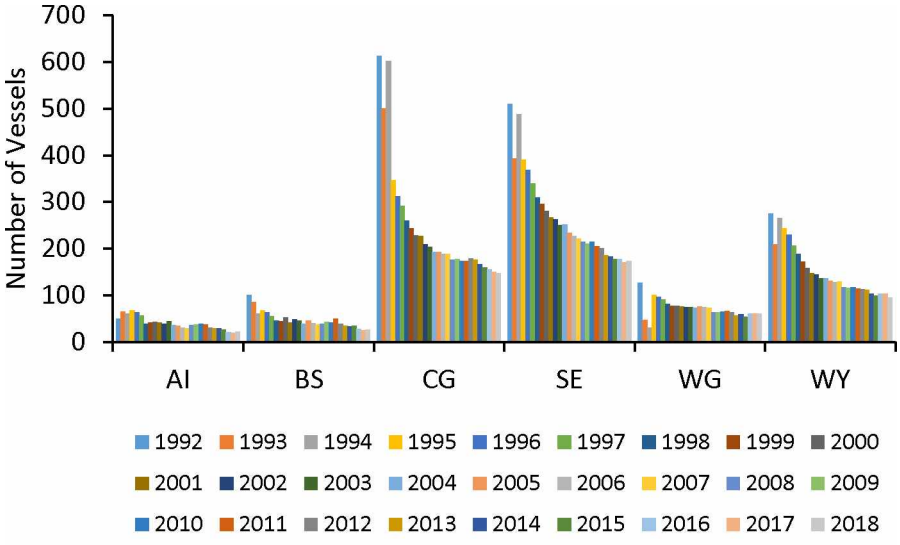

Figure 4.20. Number of vessels fishing for sablefish in Alaska by management region, 1992-2018.

Most of the vessels that fish sablefish are located in Southeast Alaska, followed by the Central Gulf of Alaska, and West Yakutat. Smaller fleet sizes are found in the Western Gulf, the Bering Sea, and the Aleutian Islands.

Homeports of Sablefish Fishing Vessels

In 2018, most active sablefish fishing vessels were homeported in Alaska (260); 54 mostly larger vessels were homeported in Washington, and five vessels in Oregon. The top three ports for sablefish landings (Seward, Sitka, and Kodiak) account for 54% of total landings (Figure 4.21). Together, the top 10 sablefish landing ports, all located in Alaska, account for 88% of all sablefish landings (NOAA 2012).

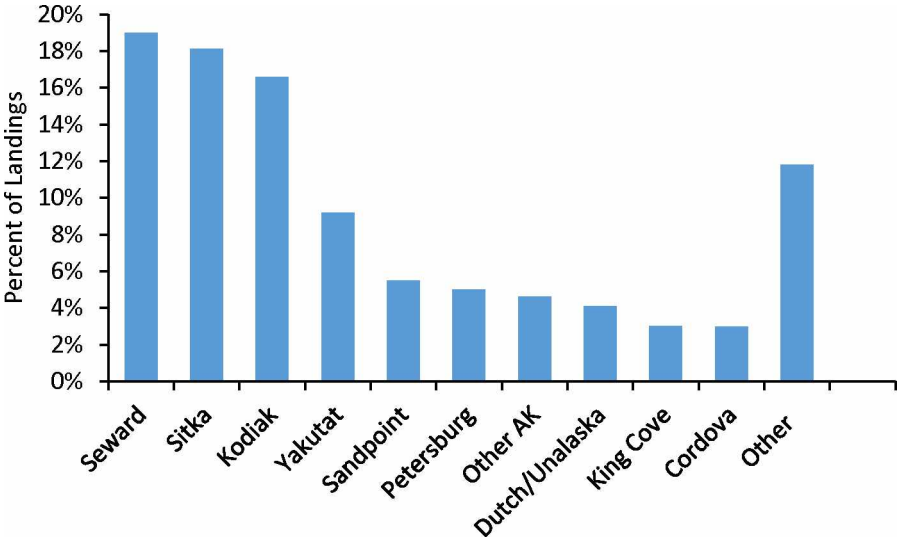

Figure 4.21. Percent of total sablefish landings by ports.

Economics of the Halibut and Sablefish Fisheries

The commercial fishery for Pacific halibut had a gross exvessel value of $111.5M in 2017, a decrease of $760 thousand from the prior year (NOAA 2019). The average exvessel price per pound for halibut was $5.68 in 2017. Before IFQs, halibut were sold into wholesale markets as a headed-and-gutted frozen product; following IFQ implementation halibut have been almost entirely marketed as a high-quality fresh product supplied throughout most of the year (Matulich and Clark 2003, Herrmann and Criddle 2006). The shift to a fresh product market, along with the change in bargaining power between processors and fishermen, increased opportunity for direct marketing and contracting with wholesalers and increased the exvessel price for halibut. On the negative side, the change shifted the advantage from small ports near grounds to larger ports with more processors and superior freight services.

The revenue per halibut vessel increased by 73% in the first year of the halibut IFQ program from $26,000 during the baseline period to $60,400 in 1995. The revenue per halibut vessel grew by 133% between 1995 and 2000 to $104,000 (Brinson 2013). Between 2006 and 2011, revenue per halibut vessel exceeded $170,000 (Brinson 2013). In 2018, the revenue per commercial halibut vessel was estimated at $175,000.

There were several effects the IFQ implementation had on the economics of halibut and sablefish. Before the IFQ, the derby-style fishery often resulted in fishermen having to wait several days to deliver their catch to a processor, lowered product quality and the exvessel price as well as the wholesale and retail prices. In the post-IFQ fisheries, the fresh halibut market is reliant on moving product quickly, and processors that do not have access to such transportation cannot process for the fresh market and offer ex-vessel prices similar to those that

do. In effect, it was anticipated that the IFQ Program would release some of the previous constraints on processing and lead to a mix of frozen and fresh products, but that this was likely to come at the cost of shifting processing out of some communities.

There are economic benefits for communities' ports to be the processor for the fishery. These include tax revenues, local employment at the processing plant, and expenditures within the community by processing workers, the processor's expenditures on fuel, electricity, water, etc., and expenditures by marine support service businesses within the community resulting from vessels making landings in the community (NPFMC 2016). However, remote Alaska communities without access to road or air transportation to hubs, which could compete for landings in the pre-IFQ halibut and sablefish fixed-gear fisheries, are at a comparative disadvantage under the IFQ Program (Dawson 2006) wherein the capacity to deliver the product to fresh markets has become increasingly important.

The commercial fishery for sablefish generated a gross exvessel value of $96.5 million in 2017. The average exvessel price per pound for sablefish was $5.66 in 2017, an increase of $0.71 from the prior year. The sablefish fishery relies mostly on an international market and is marketed as a frozen product exported to Japan (Squires et al. 1988, Hastie 1989, Matulich and Clark 2003, Fell et al. 2011, Warpinski et al. 2016). The changes in the sablefish fishery included an extended season, increases in exvessel price, change in bargaining power between processors and fishermen, increased opportunity for direct marketing and contracting with wholesalers, change in advantage from small ports near grounds to larger ports with more processors and good freight services, etc. (Warpinski et al. 2016). The change to the IFQ fishery was positive and did lead to increased market opportunity for sablefish fishery. The slower-paced sablefish fishery also led to increased management precision and safety at sea. The revenue per vessel fishing sablefish increased by 128% from the baseline period of $83,000 in 1995 to $189,000 in 2004. In 2010, the revenue per commercial sablefish vessel was $325,000 (Brinson 2013). In 2018, the revenue per commercial sablefish vessel was again $325,000.

The economic basis for QS prices and trends in halibut and sablefish QS prices since 1995 has changed dramatically. Figures 4.22 and 4.23 represent the time series of halibut QS prices by class for IPHC Areas 2C and 3A. The price of QS reflects the expected net present value of all future catches enabled by the possession of the QS (Newell et al. 2007; Huppert et al. 1996; Karpoff 1984). Note that the net present value reflects anticipated changes in commercial TAC, exvessel price, and uncertainty, as well as risk aversion and discounting. Figures 4.22 and 4.23 show that the exvessel price for halibut over the past 27 years has seen a steeper increase than the IFQ quota price. This difference reflects significant declines in the TAC during this same period.

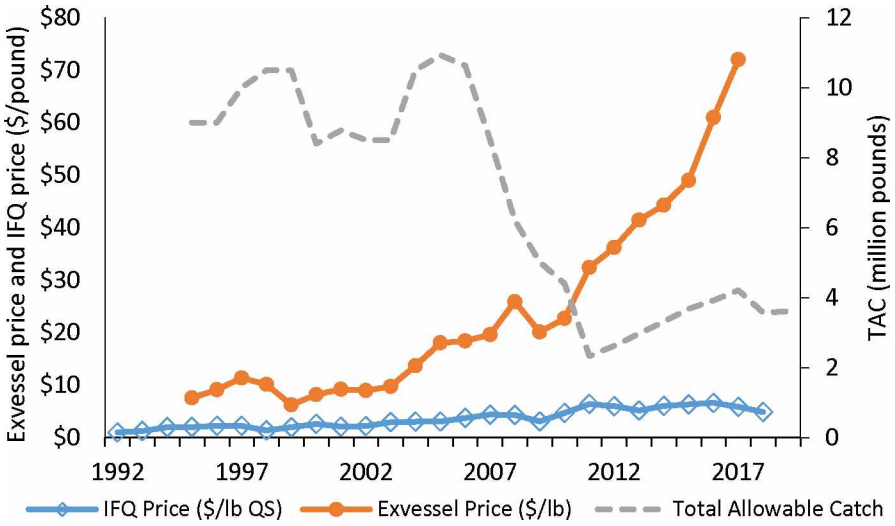

Figure 4.22. Exvessel price of Area 2C halibut compared with the price of Area 2C IFQ halibut quota per pound and Area 2C TAC.

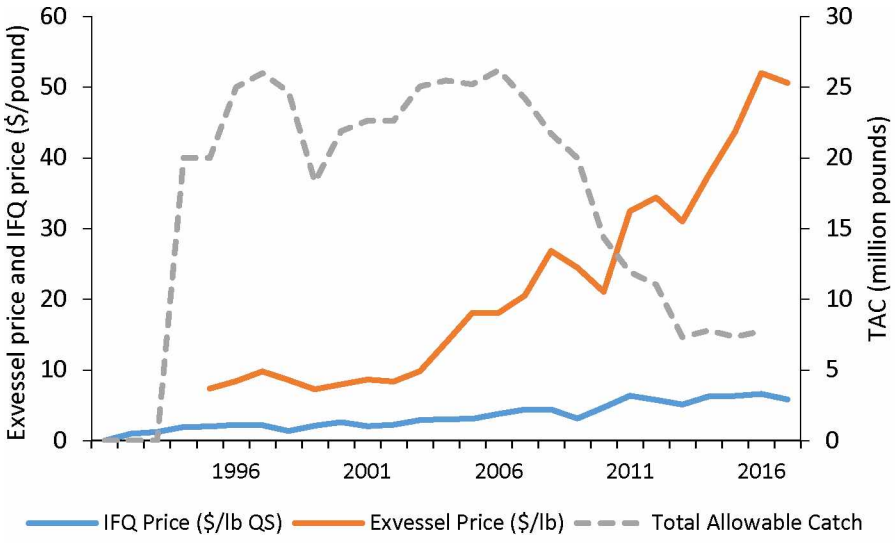

Figure 4.23. Exvessel price of 3A halibut compared with the price of Area 3A IFQ halibut quota per pound and Area 3A TAC.

Figures 4.24 and 4.25 represent the time series of sablefish QS prices by class for the SE and CG sablefish management areas.

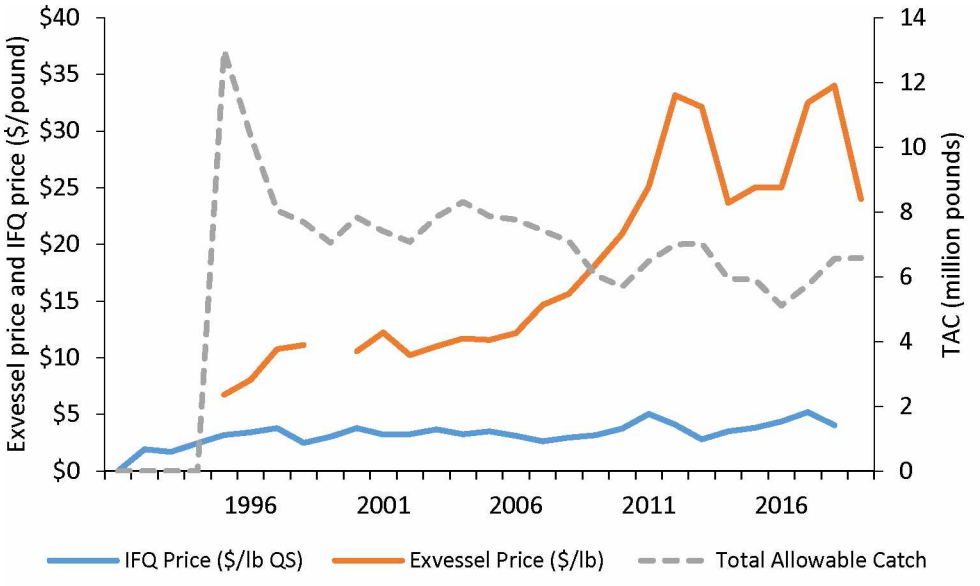

Figure 4.24. Exvessel price for Southeast Alaska sablefish compared with the price of Southeast Alaska IFQ sablefish and the Southeast Alaska TAC.

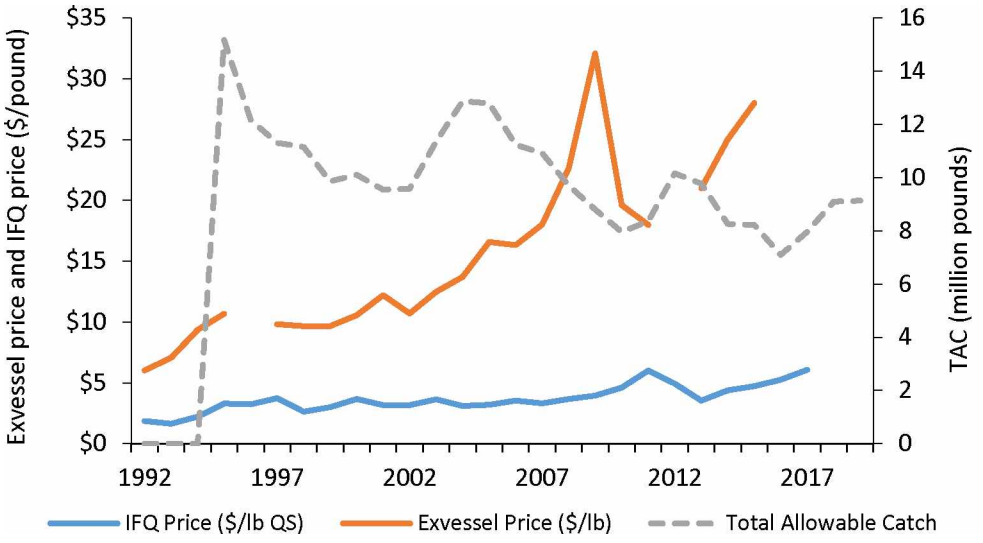

Figure 4.25. Exvessel price for Central Gulf of Alaska sablefish compared with the price of Central Gulf of Alaska IFQ sablefish and the Central Gulf of Alaska TAC. Prices are denoted in real (2018 base year) value.

These graphs show that the price the fishermen receive for sablefish and the price of sablefish IFQ have increased over the past 27 years, but the exvessel price has fluctuated to a greater degree than the price for purchasing quota. The price of SE sablefish IFQ has dropped in recent years due to the market changes for the quota. The total allowable catch has decreased to some degree but not as much as it has in the halibut fishery.

Treatment of community support measures for the fisheries

Community Support Measures in the Salmon Fishery

The State of Alaska has developed an entire division for the economic development of fisheries and seafood (Division of Economic Development) and various programs to help promote economic development in small communities and resident fishermen, but their efficacy has been limited. For example, although the State offers financial loans to Alaskan residents for the purchase of LEPs, these loans are rarely utilized by small-scale fishermen in remote communities. The reasons that small-scale fishermen from remote communities fail to take advantage of the LEP loan program include qualification requirements and loan terms (interest rates, repayment schedules, collateralization, and the magnitude of required minimum down payments). In effect, those most in need of State loans are least likely to qualify.

One reason the State of Alaska has had difficulty designing regulations or programs to assist fishermen who reside in small rural communities is that the state constitution (Article 8§15) specifies that state residents should have equal access to fisheries resources (Harrison 2019). While that language has not prevented the creation of LEPs, it has prevented restrictions on where LEP holders reside. For example, it would not be lawful to establish a requirement that LEPs for a particular fishery could only be held by individuals who reside near the fishery.

One unique method that the State of Alaska has allowed is permit sharing and stacking; this is intended to make it easier for new fishermen to enter the Bristol Bay and Cook Inlet drift gillnet LEP fisheries (CFEC 2012). The dual permit program allows two LEPs to be fished on a single vessel and allows that vessel to use a net that is 33% longer than the standard net (150 fathoms to 200 fathoms). This program was intended to make it possible for young fishermen to enter the fishery without the need to purchase a vessel as well as an LEP. Unfortunately, in practice, this program has helped more nonresident fishermen than resident fishermen (CFEC 2012).

Some fisheries in Alaska have more rural participants than others. For example, the statewide salmon troll fishery has a stronger representation of rural fishermen than nonresidents and urban residents of Alaska. The troll fishery is open for most of the year but has low catch rates; most of the LEP holders in this fishery are Alaskan residents (Gho and Farrington 2018). In contrast, in the statewide salmon power troll fishery, the number of permits holders held by rural and urban Alaskans has increased, and the number of non-resident permit holders has gone down.

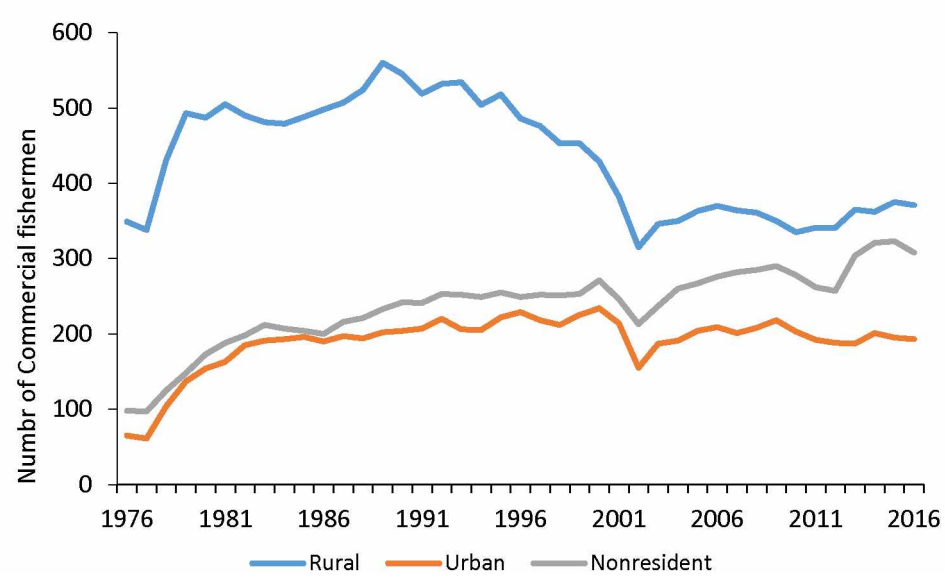

Figure 4.26. The number of QS holders for statewide troll fishery.

In contrast, in highly lucrative and seasonally compressed fisheries, such as the Bristol Bay salmon fisheries, a majority of the LEPs are held by nonresidents, and the share of permits held by nonresidents has increased through time mainly through transfers of permits from rural Alaska (Figure 4.27) (Gho and Farrington 2018).

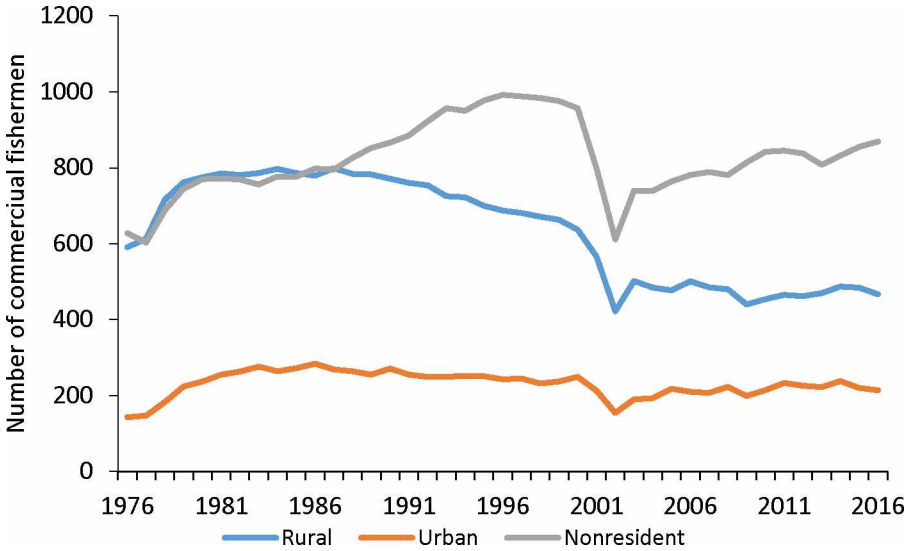

Figure. 4.27. The number of QS holders in Bristol Bay who fished, 1976-2017 (CFEC 2018).

Many small fishing communities have witnessed a similar decrease in the size of their local salmon fishing fleet. The overall decline of 2,474 permits held by Alaska Rural Locals (ARL) represents 30.0% (2,474 total

net change/8,246 total initially issued) of all transferable and non-transferable permits issued to them (Gho 2018).

Community Support Measures in the Pollock Fishery

The idea of allocating a portion of the BSAI pollock TAC to support economic development in coastal Western Alaska was started in the late-1980s and early-1990s. It was championed by Harold Sparck from Bethel and Henry Mitchell from Dillingham, who wanted a way to include the Bering Sea coastal villages into this new fishery (King 2009). Their groundwork led to the creation of the Western Alaska Community Development Quota (CDQ) program in 1992 as an element of the initial inshore-offshore sector allocation (NPFMC 1992a). The CDQ program provided residents of economically disadvantaged western Alaska communities with an opportunity to derive value from the BSAI groundfish fisheries that had been foreclosed to them because of the high capital investment needed to enter the fishery (Ginter 1995; NRC 1999b; Strong and Criddle 2013). From 1992 through 1998, the CDQ allocation included 7.5% of the BSAI pollock TAC. Importantly, this allocation was outside the open-access allocation, and the nonprofit CDQ entities (Figure 4.28) could lease their allocation in exchange for royalty payments and other considerations; also, the lessees could fish their portion of the CDQ allocation when the open-access fishery was closed (Ginter 1995; NRC 1999a; Strong and Criddle 2013).

Figure 4.28. Western Alaska CDQ communities and groups. (Source: NOAA Fisheries)

The CDQ program was designed to assist 65 small villages located within 50 nautical miles of the Bering Sea coast or on an island in the Bering Sea (Figure 4.28). Approximately 27,000 people, predominantly Alaska Natives, live in these communities. The communities have organized themselves as six 501(c) (3) non-profit corporations that manage and administer CDQ allocations, investments, and economic development projects. One CDQ group represents a single community (St. Paul), and the remaining CDQ groups represent between six and 20 communities (listed in Appendix 4.1). Since the implementation of the CDQ program, royalties from leasing quota to commercial partners and earnings based on those royalties have become one of the largest sources of non-governmental revenues in the CDQ communities (Northern Economics 2001; Northern Economics 2002; Strong and Criddle 2013). Annual allocations to the six CDQ entities are represented in Figure 4.29.

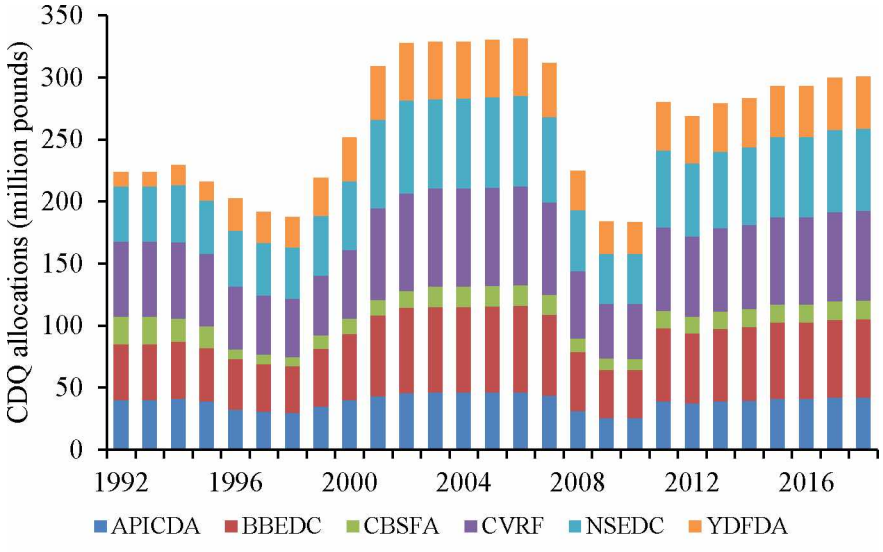

Figure 4.29. Total poundage of pollock allocated to CDQ entities, 1992 to 2018.

CDQ Pollock Allocation

When originally implemented in 1992 as part of the inshore /offshore allocation of BSAI pollock, the CDQ program was subject to a three-year review/sunset cycle (FR 1992). It was reviewed and reauthorized in 1995 and 1997 (FR 1995, FR 1997). The AFA eliminated the sunset provision and increased the CDQ pollock allocation from 7.5% to 10% of the BSAI pollock TAC (Szymkowiak and Himes-Cornell 2013; AFA 1998). The CDQ allocations were expanded in 2007 to include 10% of the annual TAC for other BSAI groundfish species, sablefish, halibut, king, and Tanner crab, and limits on the bycatch of Prohibited Species (MSA 2007; USCG 2006; NMFS 2007). The six CDQ entities have grown over the past 26 years into multibillion-dollar nonprofit enterprises that have invested in fisheries-related economic development projects in their communities. In 2016, the CDQ entities harvested 550 million pounds of seafood worth $120 million, and during that same year the CDQ groups processed 432,065,528 pounds of seafood worth $213.9 million (NOAA 2018a. The CDQ program creates hundreds of jobs annually and funds programs that have provided training to thousands of community residents for employment in the seafood industry (Haynie 2014).

Each CDQ entity is guided by a board of directors elected from the constituent communities. Consequently, each CDQ entity has developed programs uniquely tailored to the needs and priorities of their region. For example, the Bristol Bay Economic Development Corporation (BBEDC) has focused on three areas of emphasis:

1. Education, workforce development, and employment
2. Fisheries development
3. Community programs

BBEDC's education and workforce development projects include salmon camps for youth, seasonal employment, internships, scholarships for BBEDC region residents to attend universities or vocational colleges, student loan forgiveness, and at-sea employment. BBEDC's fisheries development projects include low-interest loans for fishing vessels, LEPs and fishing quotas, ice for vessels in the Bristol Bay salmon fishery, emergency transfer grants, interest rate assistance, permit brokerage and fisheries research. BBEDC's community programs include block grants to communities, grant-writing assistance, grants for infrastructure, and technical assistance. BBEDC has also provided personal finance education and tax preparation help. Additional details on the BBEDC's activities can be found on the internet (http://www.bbedc.com/), which shows in detail the programs the corporation operates to enhance regional fisheries.

Like BBEDC, the Norton Sound Economic Development Corporation (NSEDC) has programs aimed at education, workforce development, employment, fisheries development, and community support. Among other projects, NSEDC has helped to finance the regional vocational training center and has dedicated 25% of the earnings from their crab vessel, the Aleutian No. 1, to support the Bering Sea Women's group. The Bering Sea Women's group is a nonprofit that provides shelter for women and children who are victims of domestic violence. The estimated value of NSEDC's contributions to the Bering Sea Women's group, through 2013, totaled $425,000 (Taufen 2016). When a new LLC took control of the boat, they bought out the Bering Sea Women's group at the market value. The group used the funds to match a grant to renovate their center and used the interest from the remainder of NSEDC's donation to maintain operations (Johnson 2019).

Other CDQ entities have supported projects such as docks and the construction and operation of small-scale fish processing plants in communities that lacked processing capacity. CDQ entities have also provided loans and other support for the development of local small boat fisheries for halibut and Pacific cod. Several CDQ entities have used portions of their earnings to invest in large catcher vessels and catcher processors active in offshore fisheries for pollock, groundfish, and crab (NOAA 2018c). As of 2009, CDQ entities held more than 50% ownership position across firms in the catcher processor sector of the BSAI pollock fishery (Western Alaska CDQ Program 2012). For example, in 2010, Coastal Villages Region Fund (CVRF) exchanged its ownership shares in American Seafoods for the *C/P Northern Hawk*, a 341-foot pollock catcher-processor. In the deal, CVRF also took ownership of three freezer longliners (Goforth 2015).

It is difficult to know the total amount of assets the CDQ group holds in 2019. The last report posted in 2011 stated that six CDQ groups held approximately $938 million in assets, and they invested more than $176 million in CDQ communities and fisheries activities, down from a peak of $251 million in 2010 (WACDA 2011, WACDA 2012). After 2011, there is no centralized report that summarized CDQ assets (NOAA 2018a).

Community Support Measures in the BSAI Crab Fisheries

The BSAI Crab IFQ program includes several measures intended to protect revenues and employment in fishery-dependent coastal communities with a history of participation in the BSAI crab fisheries. Five community support measures have been established in the BSAI crab fisheries. First, the program established a temporary moratorium on transferring IPQ and restrictions that limited the ability of fishermen to change from one processor to another. Second, BSAI Crab quota was allocated to the Western Alaska CDQs. Third, the BSAI Crab IFQ program includes a "Right of First Refusal," which means that communities with historic participation in the BSAI crab fishery have a chance to buy IPQ before it is transferred outside the community (50 CFR 680.41). Fourth, communities can establish a non-profit organization to purchase IFQ. Lastly, the Norton Sound regional red king crab fishery is organized as a super-exclusive registration fishery.

CDQ Crab Allocation

The *CDQ crab allocation* began in 1998 as an amendment to the BSAI crab FMP (NPFMC 1997) and was expanded to 10% of the BSAI crab TAC under the Coast Guard and Maritime Transportation Act of 2006 (USCG 2006). The CDQ crab allocation is divided among the six nonprofit CDQ entities in a fixed portion but varying poundage over time. Figure 4.30 shows the number of pounds distributed to each CDQ from 1998 to 2018. The amount has fluctuated as the CDQ quota is based on 10% of the entire quota, so in a year with high quota allocation, the amount of CDQ allocation also increased (NOAA 2019 CDQ). CDQ BSAI crab allocations for the 2018/2019 season are listed in Table 1.

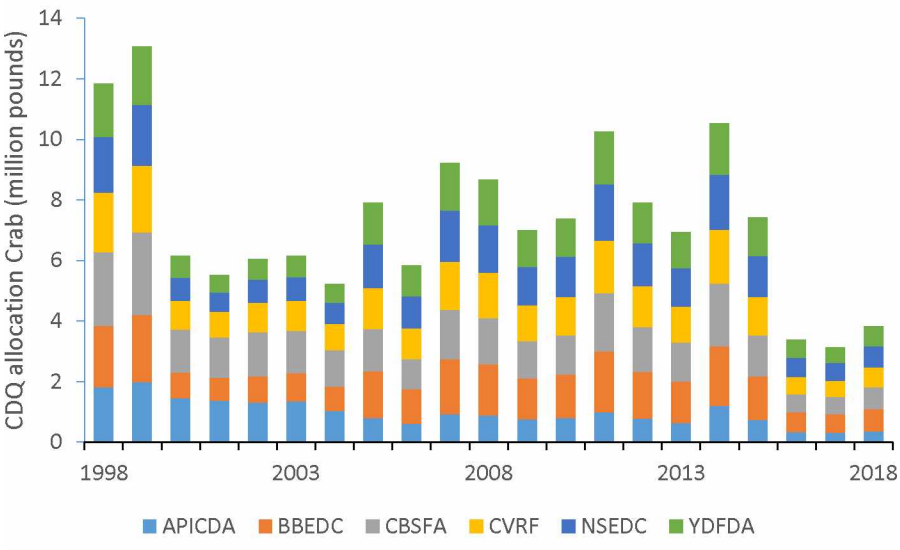

Table 4. 1 BSAI CDQ crab quota allocations, by fishery in 2018/2019.

Fishery	Vessel Landings	Allocation Pounds	Percent Landed
BBR	10	430,724	100
BSS	25	2,758,088	100
EAG	8	385,602	100
WBT	5	243,836	100
Total	52	3,818,400	

Source: https://www.fisheries.noaa.gov/sites/default/files/akro/1819cratcdqland.htm

Over the past 21 years, the CDQ entities have invested in crab harvesting vessels, purchased BSAI crab IFQ to add to their CDQ quota, and subsidized loans to help local fishermen purchase vessels and crab IFQ. Royalties and other earnings from their CDQ crab allocation have contributed to wages earned by local residents hired onto BSAI crab fishing vessels and in crab processing facilities. In addition, revenues from crab operations have contributed to workforce development, education, and community support programs in Western Alaska CDQ communities. CDQs that have invested in crab fishing vessels and processing facilities to help their region develop a stronger presence in the crab fisheries include the NSEDC and the Central Bering Sea Fishermen's Association (CBSFA).

In 1995, NSEDC established Norton Sound Seafood Products (NSSP) to manage NSEDC's engagement in Norton Sound region fisheries for salmon, herring, halibut, king crab, and bait. Over the past 20 years, NSSP has expanded its operations and established Norton Sound Seafoods Center (NSSC) in Nome. NSSC was started to improve exvessel prices and to create a more stable market to enhance the overall presence and capability of NSEDC in the region (NSEDC 2017).

CBSFA established St. Paul Fishing Company (SPFC) in 2004. SPFC's purpose is to manage fishing assets belonging to CBSFA, including vessels, gear, equipment, limited license permits (LLP), and crab, pollock, cod, and sablefish QS allocations. (CBSFA 2019). A subsidiary of CBSFA is "*57 Degree North*", which bought two blocks of processing quota in 2014 and 2015. The purchase was a large block of north region opilio crab processing quota, (which historically had been processed on a floating processing vessel.) They made this purchase to ensure that this crab will be processed in the *Trident Seafoods* St. Paul plant. The addition of this product to the Trident plant increases the economic viability of and provides a stable landing tax base for the City of Saint Paul (CBSFA 2019). In 2015, *57 Degree North* purchased additional crab quota from *Icicle Seafoods*. This was a large purchase of opilio south region processing quota, (undesignated eastern Bairdi processing quota and undesignated western Bairdi quota.) The goal of CBSFA was to have a set amount of eastern and western Bairdi processed in the Trident plant on St. Paul Island (CBSFA_2019).

Processing Quota Community Provisions

A processing quota provision allows communities the right of first refusal to purchase quota if a local processor plans to sell or transfer their PQS out of the community (NMFS 2004). To date, two communities have exercised this authority to purchase PQS: Kodiak (represented by Kodiak Fisheries Development Association) and King Cove/Sand Point (represented by Aleutia, Inc.). These two communities purchased a small amount of processing quotas in circumstances that have allowed them to participate in the program. The purchase was not part of a long-term plan to build up quota for the community; it was merely an opportunity they took when it presented itself. For example, Kodiak purchased PQS when a local processor found itself hold excessive quota shares as a result of a business acquisition (NOAA 2019a). The Kodiak Fisheries Development Association now leases the processing quota and receives a profit from the sales each season (Freed 2019).

The implementation of the crab rationalization program brought a substantial decline in harvesting vessels over the fishing season and a corresponding change in the communities, with a shift in the amount of crab harvesting from smaller communities to larger communities and communities outside Alaska (Kasperski et al. 2016). The first right of refusal provision was intended to create a mechanism whereby small communities could retain local processing capacity and associated economic activities. However, there is a high level of confusion on these processing quotas provisions and how they can work for the local communities. Several communities indicate that they do not understand the program and that they fill out the paperwork that the lawyers provide. These communities express a desire for greater clarification on what these provisions do and how they can benefit their community.

Eligible Crab Community Organizations

Eligible Crab Community Organizations (ECCO) are authorized to purchase and lease BSAI crab to support economic development and continued community engagement in the BSAI crab fisheries (NMFS 2004). The eligible communities are listed in Table 2. Any eligible community may apply to form an ECCO[5], and, once approved, the ECCO may purchase BSAI crab QS and lease the associated IFQ to community residents. ECCOs that purchase QS are required to submit annual reports to NMFS. To date, none of the eligible communities has formed an ECCO.

Table 4.2 Eligible Crab Communities

CDQ Communities	Non-CDQ Communities
Akutan (APICDA)	Unalaska/Dutch Harbor
False Pass (APICDA)	Kodiak
St. George (APICDA)	King Cove
St. Paul (CBSFA)	Port Moller
	Adak

There has been some communication with communities talking about different programs, and the ECCO was one that many community members did not know about or have difficulty understandings. Some of the comments received recommended that advertising these programs to nonprofits in rural fishing communities would be a helpful way to inform the communities. Communities also suggested that the programs need to be described in simple terms, such as free fishing permits, no strings attached, etc., which would help get people's interest.

Norton Sound Superexclusive Registration

The Norton Sound red king crab fishery is not included in the BSAI crab IFQ program. Instead, this small fishery that grosses about $3 million per year is managed by the state. The fishery was restricted to small boats in 1993 and designated a superexclusive fishery in 1994. The superexclusive designation means that a vessel registered for the Norton Sound red king crab fishery cannot participate in any other king crab fishery during that year (Natcher et al. 1996; Natcher et al. 1999). The superexclusive designation has discouraged larger vessels from participating in this fishery. Thus in practice, superexclusive registration in the Norton Sound red king crab fishery has functioned to create a *de facto*, communally held, Territorial Use Right Fishery (TURF) (Criddle et al. 2001). Time series of exvessel revenues and participation in the Norton Sound red king crab fishery are represented in Figure 4.31.

[5] The application to form an ECCO is available at https://alaskafisheries.noaa.gov/sites/default/files/eccoapp.pdf.

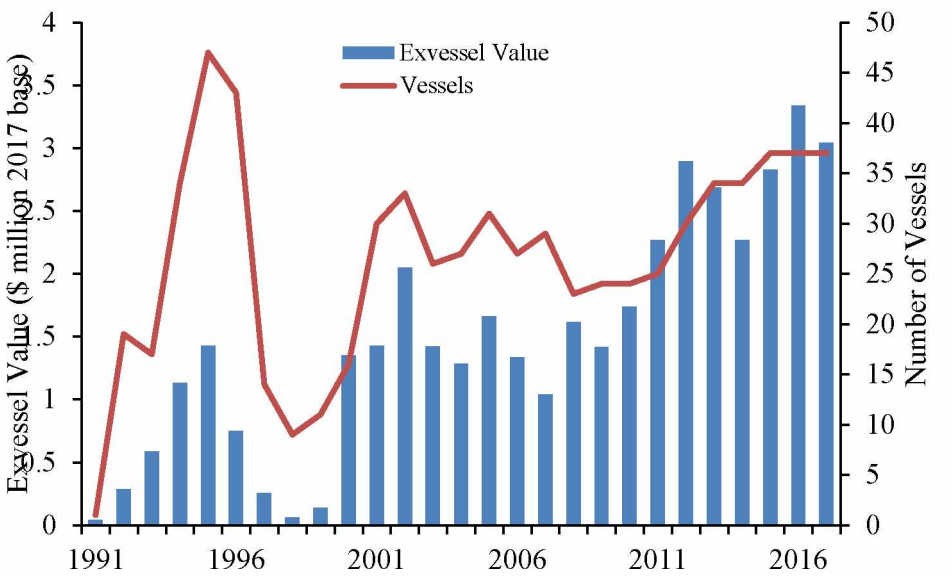

Figure 4.31. Participation (number of vessels) and exvessel nominal value in ($ million) for the Norton Sound red king crab fishery, 1991-2017.

The superexclusive designation of the Norton Sound red king crab fishery has provided some improvement in economic and social sustainability in Norton Sound communities because that designation reduced the number of participants from outside the region and reduced the intensity of the race-for-fish.

Community Support Measures in the Halibut and Sablefish IFQ Fisheries

The general pattern of halibut and sablefish QS ownership since program inception entails decreasing ownership in remote rural communities with ownership consolidating towards urban centers, such as the greater-Anchorage area, and to larger rural communities with superior logistic resources. The halibut and sablefish IFQ program has been cited as a contributing factor to the decline of remote fishery-dependent communities (Himes-Cornell and Hoelting 2015; Carothers et al. 2010; Carothers 2008). Many residents of smaller communities in Alaska participated in the halibut fishery because it was a natural fishery to participate in, with inexpensive gear that could be deployed from small general-purpose vessels. Moreover, during the pre-IFQ derby, the advantage of being close to productive fishing grounds more than offset the disadvantages of fishing from small ports with limited port services and few fish buyers.

The two principal community support programs for the halibut and sablefish fisheries are the Western Alaska CDQ program that allocated halibut and sablefish QS to the six CDQ entities and the GOA Community Quota program that allows the formation of Community Quota Entities (CQE) that are authorized to purchase halibut QS.

Halibut and Sablefish CDQ allocations

The NPFMC added halibut and sablefish to the Western Alaska CDQ program when it took final action to establish an IFQ program for the commercial halibut and sablefish fisheries in 1995 (59 FR 61877, 12/02/1995). The CDQ allocation of halibut is in IPHC Area 4. In total, the CDQ entities were allocated 35% of the QS for IPHC Area 4. They received 100% of the halibut QS in Area 4E, 50% of the halibut QS in Area 4C, 20% of the halibut QS in Area 4B, and 30% of the halibut QS in Area 4D. Because halibut can be caught near some CDQ communities, these allocations were expected to provide real fishing opportunities for CDQ community residents. The CDQ fleet targets halibut but may retain incidental catches of other groundfish for personal use.

Additionally, CDQ fishermen are allowed to retain undersized halibut for personal use, provided they hold a Subsistence Halibut Registration Certificate from NMFS Restricted Access Management. Catches of CDQ halibut had an exvessel value of $7.0M in 2018. The fleet delivered 69% of its landings to Atka and St. Paul. The average exvessel price per pound for CDQ halibut was $2.91, an increase of $1.06 from the prior year. From 1995 through 2017, the cumulative allocation of CDQ halibut was 44.46 million pounds (Figure 4.32). To calculate the exvessel value of 44 million pounds, one would take the average price of the amount landed and multiply it by the price of halibut being offered at that time. If the amount were around $3.00/pound, this would mean that the CDQs were awarded halibut QS worth approximately $133 million.

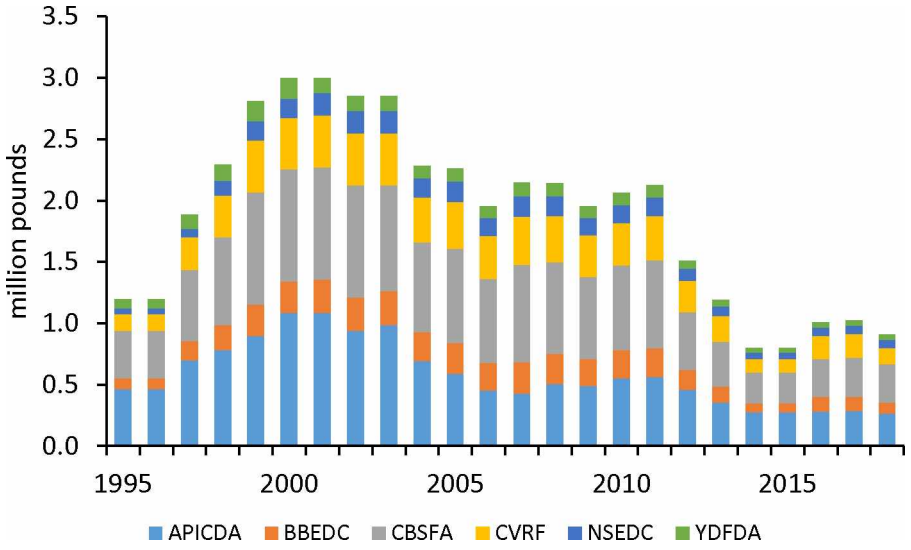

Figure 4.32. Total allocation (million pounds) of halibut IFQ to the CDQ nonprofit corporations, 1995-2018.

The CDQ entities were also allocated about 2 percent of the combined BSAI and GOA sablefish QS. In 2018, the CDQ allocation of sablefish was 1,181,344 pounds (NOAA 2018a). From 1995 through 2017, the

cumulative allocation of CDQ sablefish was 31.59 million pounds, with an exvessel value of $112 million (Figure 4.33).

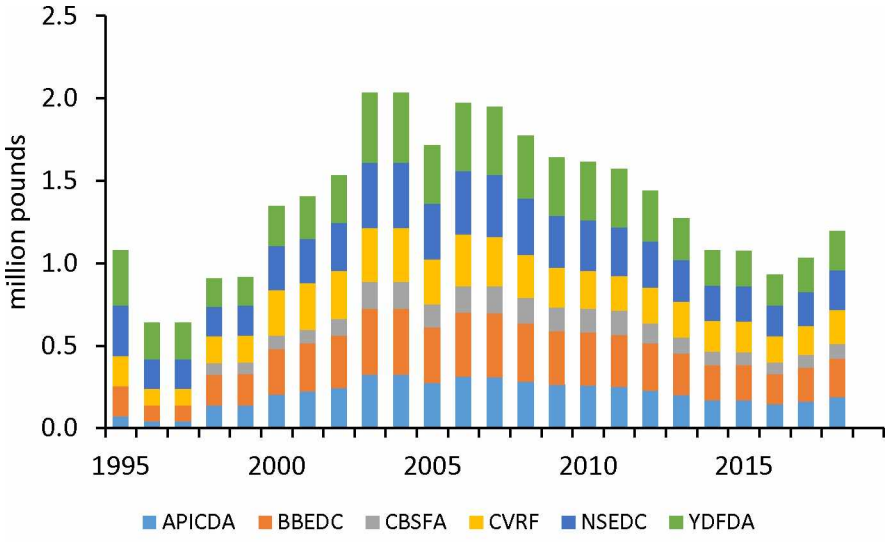

Figure 4.33. Total allocations (million pounds) of sablefish IFQ to the CDQ non-profit corporations, 1995-2017.

The total allocation to sablefish from CDQ has fluctuated from 1995 to 2017. Recent years have seen a slight increase.

The CQE Program

In 2004, nine years after the implementation of the halibut and sablefish IFQ program, the NPFMC approved the creation of a Community Quota program for the GOA (FR 2004). The program authorized the creation of Community Quota Entities (CQE) and modified the IFQ program to allow a community to purchase halibut or sablefish QS (FR 2004). The objective of this program was to enable smaller GOA communities to rebuild and sustain their engagement in the halibut and sablefish fisheries. The communities eligible to participate in this program are illustrated in Figure 4.34.

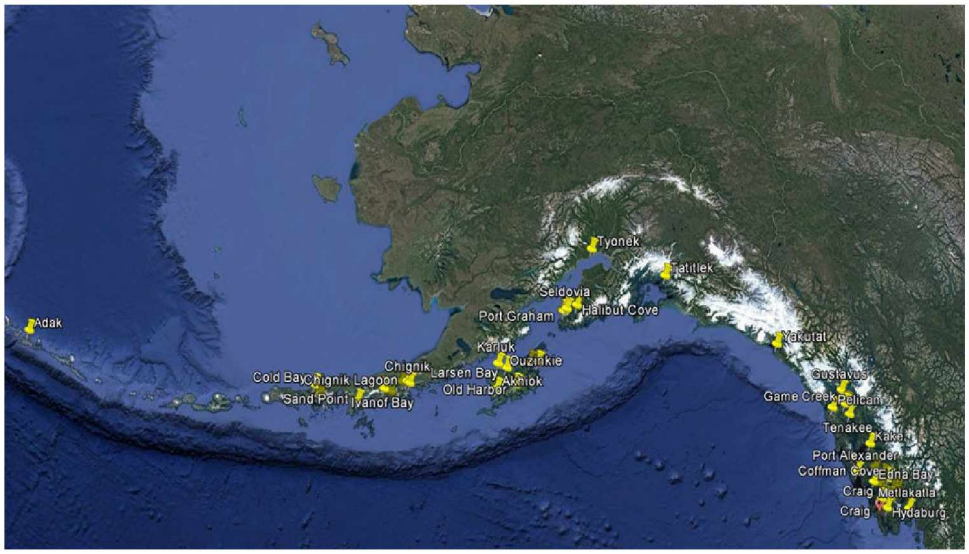

Figure 4.34. Communities eligible to submit applications to form Community Quota Entities. (See Appendix 4.1 for a list of CQE eligible communities.)

NOAA (2016) shows that the amount of quota held in the communities that qualify for the CQE program has declined since 1995 in poundage (Figure 4.35) and exvessel value (Figure 4.36). The number of individuals making landings has also declined.

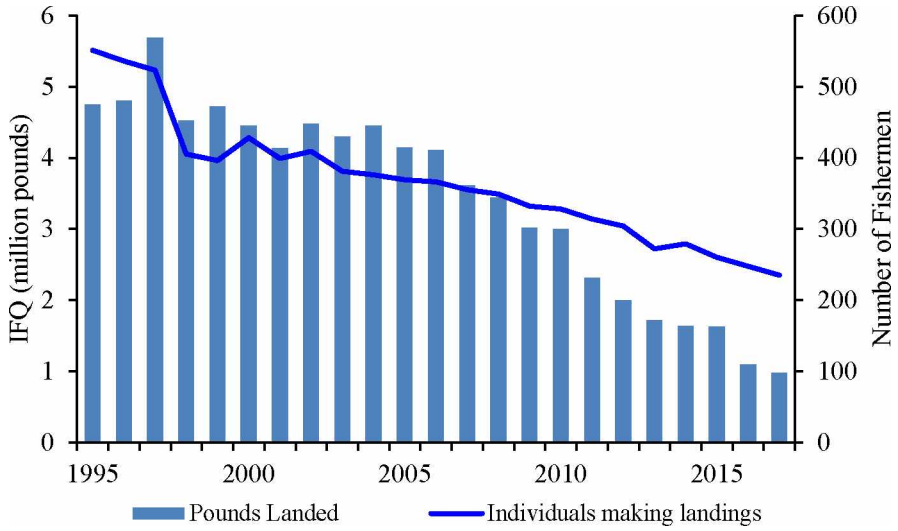

Figure 4.35. Total IFQ (million pounds) held by fishermen who reside in 42 CQE communities and the number of fishermen making landings of CQE quota for both halibut and sablefish (NOAA 2016).

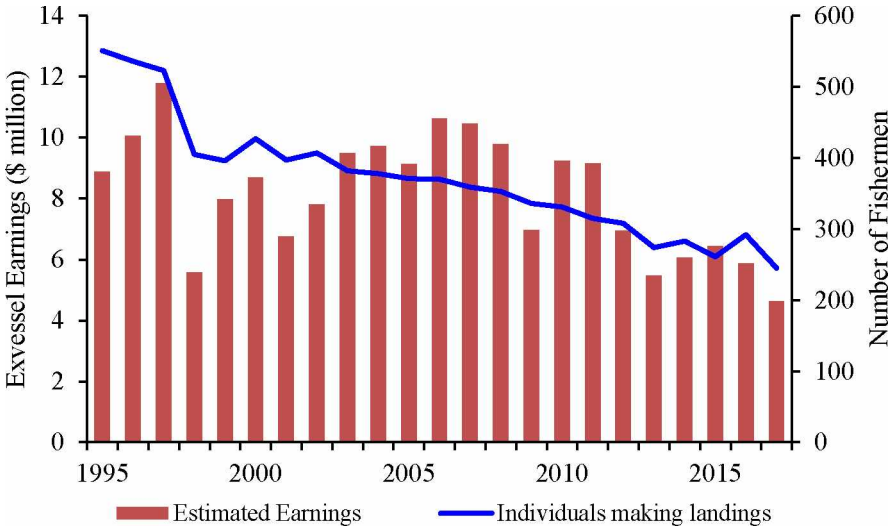

Figure 4.36. Estimated earnings in real prices ($ million) from IFQ held by halibut and sablefish fishermen who reside in 42 CQE communities and the number of fishermen making landings of CQE quota. (NOAA 2016). (See Appendix 4.1 for a list of the communities.)

Since 1995, together, the 42 small GOA fishing communities eligible to form CQEs have experienced a 56% decline in individuals making landings, and a 79% drop in pounds landed (Figure 4.35). In addition, as depicted in Figure 4.36, these communities have experienced a 35% decline in halibut IFQ and a 55% decline in sablefish IFQ (NOAA 2016). A portion of the decline in IFQ pounds is due to reductions in the halibut and sablefish TACs, but most of the decline is due to reductions in the amount of QS held by community residents (Himes-Cornell and Hoelting 2015; NOAA 2016; NOAA 2015a; NOAA 2010; NOAA 2007). Employment and income in these remote communities are mainly dependent on fisheries because there are few alternative economic opportunities. Consequently, a decline in the number of QS holders can have significant social and economic impacts (Himes-Cornell and Hoelting 2015; Carothers et al. 2010; Carothers 2008). The CQE program allows small coastal communities (Figure 4.34) to purchase limited amounts of class-B and class-C halibut and sablefish QS to hold in trust for use by community residents. The eligible communities each have fewer than 1,500 residents, are not on the road system, and have a history of fishing halibut and sablefish. So far, 28 of the 42 eligible communities have formed nonprofit CQEs, but only five of these CQEs have purchased quota (NOAA 2019c). One reason so few communities have taken advantage of the program is the opportunity cost of using scarce financial resources to purchase quota; expenditure of community funds to purchase QS vies against expenditures to support community infrastructure, schools, and other economic development activities. QS prices are roughly ten-times the mean expected exvessel price, so the acquisition of enough QS to support a viable community fishery could be very expensive.

CQE Extensions

Charter Halibut Permits (CHP)

In 2011, the sport-charter (for-hire) fishery for halibut was put under an LEP program, the Charter Halibut Limited Access Permit (CHLAP) program (NPFMC 2009). Under the program, Charter Halibut Permits (CHP) were issued to 1,022 individuals or businesses that could document their history of halibut charter fishing trips during 2004 or 2005 in 2008. Since program implementation, charter halibut operators are required to have a CHP onboard every vessel used for halibut charter fishing trips. Like IFQ and LEPs, CHPs are revocable perpetual use rights that can be transferred by gift or sale. The CHLAP program limits the number of CHPs that can be held by any individual and sets an upper limit on the number of anglers-per-trip. In addition to limiting entry in the charter halibut fishery, the CHLAP program included a provision to allow CQEs to request no-cost community CHPs for the halibut charter fishery in areas 2C and 3A. To date, NMFS has issued 104 CHPs to CQEs (NOAA 2019c).

Pacific Cod License Limitation Permits (LLP) Program

The CQE program was extended in 2011 to allow CQEs to qualify for License Limitation Program (LLP) permits (longline or pot) for Pacific cod (50 CFR 679.4(k)). Each community may receive a limited number of Pacific cod LLP licenses and assign those LLP licenses to specified users and vessels (which must be < 60' LOA and use longline or pot gear) operating from those communities (50 CFR Part 679: Table 21). The program allows issuance of up to 27 licenses for Western GOA CQEs and up to 58 licenses for Central GOA CQEs. To date, five communities have qualified for this license; one community is currently using the LLP.

Community Participation in CQE and Aligned Programs

Although communities have been slow to take advantage of the full suite of community support programs, most of the programs have been implemented in at least a few communities. Table 3 summarizes the CQE community support programs and the extent to which communities have taken advantage of those programs.

Table 4.3. CQE program permits and use

Community Program	Name of Permit	Year Initiated	Eligible Communities	Communities with approved CQEs [1]	CQEs with QS, LLPs or CHP
Halibut and Sablefish IFQ Community Purchase Program	Quota Share (QS)	2004	46	27	6 CQEs hold QS (2.5 million QS units)
Charter Halibut Limited Access Program (CHLAP)	Community Charter Halibut Permit (CHP)	2011	32	20	12 CQEs hold 48 CHPs for are 2C; 8 CQEs hold 56 CHPs for Area 3A
Groundfish License Limitation Program (LLP) (non-trawl groundfish permits endorsed for Pacific cod)	Community Pacific cod Permit (LLP)	2011	21	5	5 CQEs hold 36 LLPs (2 named vessels for 2019) [2]
BSAI crab IFQ Community Purchase Program	Eligible Crab Community Organizations (ECCO)	2005	9		0

1. Aleutia, Inc. represents both King Cove, Cold Bay, and Sand Point.
2. Community LLP licenses cannot be used in a year unless and until a CQE names vessels and individuals who will fish its permits. PACIFIC QUEST, SHAREENA
https://alaskafisheries.noaa.gov/sites/default/files/reports/19cqenamescontacts.htm

Halibut and Sablefish CQE

Figure 4.37 depicts the time series of CQE halibut QS holdings for the five communities that have purchased halibut QS and the corresponding time series of commercial QS holdings for community residents.

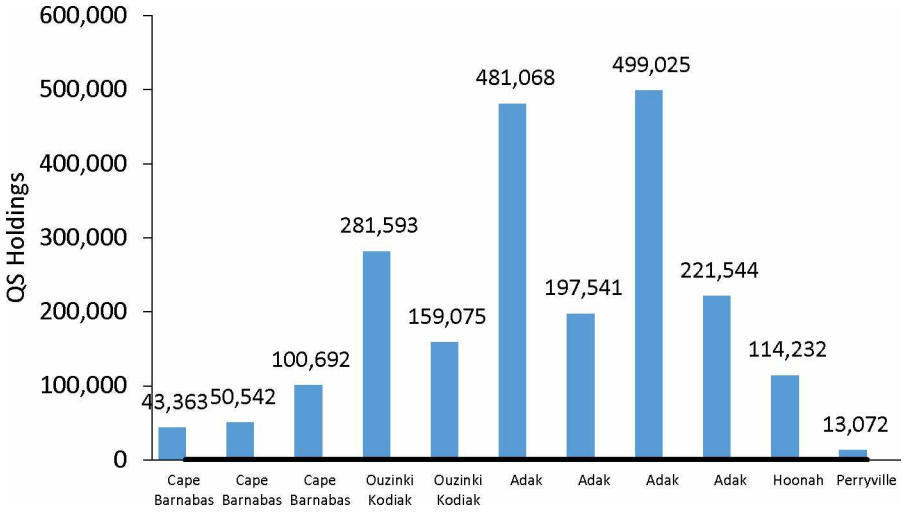

Figure 4.37. Time series observations of halibut and sablefish QS purchased by the five CQEs that have purchased halibut QS.

The five CQE communities that have purchased halibut or sablefish QS have each done so in unique ways. One of the first to purchase quotas was Cape Barnabas Inc., a CQE for the community of Old Harbor on Kodiak Island. Cape Barnabas Inc. is a nonprofit 501(c)(3) organization supported by the Old Harbor Native Corporation. To date, Cape Barnabas Inc. has purchased 43,363 units of class-C halibut QS in IPHC Area 3A, and 50,542 units of class-B halibut QS in IPHC Area 3B, and 100,692 units of class-C halibut QS in IPHC Area 3B (NOAA 2019). The total poundage associated with Cape Barnabas' QS in 2019 is 8,391pounds. Fishing this poundage has provided crew jobs each year for community members. Unfortunately, Cape Barnabas Inc. purchased halibut QS right before a substantial drop in halibut biomass that caused the poundage associated with halibut QS to drop by a large percentage (Fields 2019).

Ouzinkie, a community on Spruce Island in the Kodiak archipelago, formed a CQE, the Ouzinkie Community Holding Corporation (OCHC), in 2004. Shortly after getting established, Ouzinkie authorized OCHC to use a portion of the proceeds from the sale of timber on tribal lands to purchase 281,593 units of class-C halibut QS and 159,075 units of class-D halibut QS in IPHC Area 3A. The total poundage corresponding to OCHC's halibut QS in 2019 is 19,210 pounds.

The Adak Community Development Corporation (ACDC), representing the Aleutian Islands community of Adak, was added to the CQE program in 2008. ACDC purchased 481,068 units of class-B halibut QS and 197,541 units of class-C halibut QS in IPHC Area 4B, and 499,025 units of class-B sablefish QS in the AI management area, and 221,544 units of class-C sablefish QS units in the AI management area. In 2019, those QS holdings will support up to 166,575 pounds of halibut and sablefish.

In 2017, the city of Hoonah, through the nonprofit Hoonah Community Fisheries Corporation (HCFC), purchased 114,232 units of class-C halibut QS in IPHC Area 2C. To finance this purchase, Hoonah used funds accumulated over seven years from lease payments received for the use of their community CHPs. HCFC also received a $500,000 grant from the City of Hoonah. The HCFC leases QS at rates intended to return 45% of exvessel revenues to the program, leaving 55% of exvessel revenues to lessees. Halibut caught by lessees is sold to a local processor and is offered fresh at the local fish and chips restaurant that caters to cruise ship tourists (Gray 2019). HCFC plans to purchase more quota in the future.

Perryville, a small (~100 persons) community on the Alaska Peninsula, formed the Perryville CQE to purchase 13,072 units of class-C halibut QS in IPHC Area 3B. This yielded 631 pounds of halibut quota to be fished by several small boats in 2019. It is anticipated that this poundage will be used, in part, to help young

fishermen learn how to fish for halibut (Perryville 2019). The Perryville CQE plans to purchase an additional 57,349 QS units of IFQ halibut quota as funds become available.

Some elements of the CQE program have made it difficult for eligible communities to form CQEs and for the CQEs to function as profit centers for their communities. One limiting requirement is that a person must be a resident of the community for 12-months to be eligible to fish CQE halibut or sablefish QS. This might be a good model for retaining fishermen who already reside in the community but is not a suitable mechanism for attracting new fishermen to establish themselves in the community.

For some communities, another barrier to the development of CQE-based fisheries is that in the 25-years since the implementation of the Alaska halibut and sablefish IFQ program, many of the active fishing vessels have increased their QS holdings up to the maximum allowed under vessel cap regulations[6]. The vessel caps are maximum fractions of the IFQ that can be caught on any single fishing vessel by any given QS-holder. Vessel caps were established to limit fleet consolidation. Vessels that have reached the vessel cap are not eligible to help fish the CQE quota. An unintended outcome of the vessel caps is that it has been difficult for some CQEs to find fishermen and vessels to fish their QS. In 2012, the NPFMC considered an amendment to the halibut and sablefish IFQ program to create an exemption to the vessel caps to allow a vessel to catch its quota (subject to the cap) as well as the CQE quota (not subject to the cap). The proposed amendment did not pass (NPFMC 2014).

Several communities have expressed a desire to form CQEs and acquire QS to sustain and expand local fishing fleets. However, many of these communities have found that anticipated lease revenues are insufficient to offset traditional financing costs without raising lease rates to levels that are financially infeasible for local fishermen. These communities suggest that they would be more likely to acquire QS if grants or low-interest loans were made available through state or federal economic development programs.

Halibut CHP

Thirty-two eligible communities have access to the CHLAP, but only 20 communities have approval and are successfully taking advantage of Halibut CHP. As noted above, Hoonah applied for and was awarded 4 CHPs. Lease payments from the first seven years were saved, and with additional funds from the city, they were able to purchase 114,232 units of halibut QS in 2018 for the HCFC. The HCFC leased its QS to

[6] The IFQ vessel caps vary by IPHC management area, QS-class, and fishery. For halibut, the vessel caps are typically 1% of the Area 2C and 0.5% of the combined Area 2C, 3A, and 3B halibut QS, and 1% of Southeast and 1% of all combined sablefish QS.

commercial operators for a percentage of the value of the landed halibut. Similarly, the CQE nonprofit established by the Thorne Bay receives the lease payments from their four CHPs. The Thorne Bay CQE intends to continue to accumulating funds until it has sufficient to use to purchase halibut QS to lease to its commercial fleet (Egelston 2016).

Pacific Cod LLP

It is difficult to describe the success of communities taking advantage of Pacific cod LLPs. Only one CQE, Aleutia, has taken advantage of the opportunity to acquire Pacific cod LLPs. Aleutia currently operates two vessels that have LLP licenses for Pacific cod under this program. When asked about their lack of participation in this program, the CQE leadership of other communities indicated that the application is complex and challenging to understand. CQE leaders suggested that it would be helpful to have examples available to serve as templates to follow in the preparation of application forms. They also suggested that it would be helpful if the NMFS-Alaska Region Office could create a dedicated staff position filled by someone who understands the program and is willing to help CQE's better understand opportunities within existing community support measures, how to complete applications and options for financing purchases of QS. A large amount of paperwork needs to be submitted with these programs, and this can be overwhelming for small communities.

ECCO Eligible Crab Communities

The Bering Sea Aleutian Islands (BSAI) Crab Rationalization Program included provisions to allow nine named communities to establish nonprofit Eligible Crab Community Organizations (ECCOs) patterned after the halibut CQEs. The nine ECCs and their governing bodies are:

- Adak – City of Adak
- Akutan – Aleutian Pribilof Island Community Development Association
- Unalaska/Dutch Harbor – City of Unalaska
- False Pass – Aleutian Pribilof Island Community Development Association
- King Cove – the City of King Cove and Aleutians East Borough
- Kodiak – the City of Kodiak and Kodiak Island Borough
- Port Moller – Aleutians East Borough
- Saint George – Aleutian Pribilof Island Community Development Association
- Saint Paul – Central Bering Sea Fishermen's Association

All of the ECCs, except Adak, have a registered an Eligible Crab Community Entity (ECCE). The ECCE has the authority to exercise a right of first refusal of transfer (ROFR) of crab Processing Quota Share (PQS) or

Individual Processing Quota (IPQ) outside the ECC. For ECCs that are also CDQ communities, the ECCE is the CDQ Group. For non-CDQ communities the ECCE are:

- Unalaska - Unalaska Crab, Inc.
- Port Moller - Aleutia, Inc.
- King Cove - Aleutia, Inc.
- Kodiak - Kodiak Fisheries Development Association

At present, none of the ECCEs hold crab quota share (QS) on behalf of an ECC, and no ECCE has ever obtained QS by transfer. An ECCE is only required to submit an annual report if they hold QS[7].

With regard to which communities have ROFR contracts with PQS holders, NMFS does not require contracts to be submitted or require that the PQS holders inform NMFS annually whether or not they have a contract in place. A list of PQS holders on the NMFS website shows which PQS holders have PQS that may be subject to a ROFR agreement with the community listed (NOAA 2013).

Community, Ceremonial, and Educational Use Permits for Halibut

In 2005, the Pacific halibut subsistence fishery rules were amended to create special permits for community, ceremonial, and educational harvests by qualified Alaska communities and Alaska Native Tribes (70FR16742 2005). Permit holders must comply with Subsistence Halibut Registration Certificate (SHARC) registration and reporting requirements. These special permits for halibut harvests could be used as a tool to help youth and the community get engaged in halibut fishing.

Community and ceremonial harvest permits can be fished in Area 2C or Area 3A by representatives of Alaska Native tribes or on behalf of communities listed in 50 CFR 300.65(g)(1) or 50 CFR 300.65(g)(2). NMFS may issue a community or ceremonial harvest permit to any community or Alaska Native tribe that applies and that is qualified to conduct subsistence fishing for halibut. NMFS will issue a community or ceremonial harvest permit to a community in Area 2C or Area 3A only if the applying community is listed as eligible in Area 2C or Area 3A, and no Alaska Native tribe exists in that community. As of 2018, one ceremonial and education permit, and eight community harvest permits have been issued (NOAA 2019d).

Eligible communities or Alaska Native tribes may each appoint one community harvest permit coordinator. The participating fisherman must carry a Community Harvest Permit (CHP) card as well as a valid SHARC. CHPs

[7] Note that individual ECCE holdings of QS would be confidential and that total ECCE holding of QS could only be reported if at least three ECCEs held QS.

expire one year from the date of issuance but can be renewed. Tribes or communities that hold CHPs must maintain a harvest log and submit the log to NMFS on or before the permit's expiration date (NOAA 2019e).

Federal Halibut Education Permits

Federal halibut education permits are similar to community and ceremonial harvest permits and can be obtained in Area 2C or Area 3A. The person that is coordinating the permit must have a SHARC card, and the permit only allows harvest of up to 25 fish. Permittees must submit a harvest log upon completion of the fishery (70 FR 16742 2005.). Some communities have taken advantage of this program, including Ketchikan and Tatitlek. There is a provision that allows the vessel operator to be reimbursed for their fuel and other expenses.

State of Alaska Educational Harvest Permits

For state-managed fisheries, e.g., salmon, the Alaska Commercial Fisheries Entry Commission (CFEC) can issue a limited number of permits for use in middle school or high school educational programs. CFEC has approved ten educational permits over the years. For example, the Cordova High school program has a classroom component and an apprenticeship component that places students on working vessels for the summer season. Upon completion, the students receive two years of participation history that can be used towards meeting state LEP and vessel loan eligibility requirements. The program in Bethel involved 14 resident middle school students and two instructors with a skiff and subsistence fishing gear. In the classroom, students were taught about vessel operations and maintenance, personal safety, fishing techniques, fish identification, and a history of commercial fishing with an emphasis on the Yukon–Kuskokwim area and commercial fishing regulations (Twomley 2016).

Other Programs Intended to Help Youth Enter Fisheries

There are several examples of how regions encourage their youth to participate in the local commercial fisheries. One example is in Maine, where there is a student program created when the lobster fishery entered into a limited entry fishery, to allow access for younger people growing up on the coast of Maine to enter the fishery. To qualify for the program, the individual must be a full-time student, they must complete the apprenticeship program, and they must purchase their license before they turn 18, which will allow them to avoid being on a waitlist to receive quota. The students can fish up to 150 lobster traps for the season and it has helped youth enter the lobster fishery in Maine (Gilbert 2016).

The Alaska Longline Fishermen's Association in Sitka Alaska started an apprenticeship program, and as of 2019, 54 apprentices have entered the program. The program was funded by the National Fish and Wildlife Foundation's Fishery Innovation Fund and the City of Sitka, and it was supported by local fishermen who took the time to train young fishermen out on the fishing grounds. The common goal was to motivate young people and to provide safe real-world experience in commercial fishing and the lifestyle it provides. In each of the past two years, over 100 young people have applied to the program, which is more than the current program can accommodate, but this shows that there is a keen interest from youth to participate in commercial fishing careers (Behnken 2019).

Norway has also implemented is a program that recruits young boat owners that fish on vessels 30 to 45 feet. That program has distributed quota to 10 to 20 individuals, and it has helped sustain fisheries in their communities. Another program intended to attract Norwegian youth to fishing careers is the "youth recreation quota" that allows youth (aged 12-25) to offer recreational fishing charters during the summer (June 21 to August 31). The youth recreation quota is limited to no more than 3,000 tons a year (Eythorsson 2016).

International approaches to helping fishing communities

Community-based Fishery Programs in Iceland

Iceland has two programs to help support community-based fisheries. First, the local fishermen can be issued a class of quota shares that includes a requirement that catches be landed in their home community (Chambers 2016). The community has a right of first refusal to buy the quota and boat when it leaves a fishery. The second Icelandic program intended to support coastal communities is the coastal fishing quota program. The coastal fishing quota is a share of total allowed catch allocated to an open-access fishery. The fishery is open from May to August, Monday through Thursday, with a 14-hour time limit. Participants are allowed to use up to four jig machines and are allowed to land up to 1,433 pounds of bottom fish per day (Chambers 2016).

Community-based Fishery Programs in Norway

Norway has implemented several programs to sustain place-based fisheries since the inception of an individual vessel quota (IVQ) program for the coastal fleet in the 1990s. Norway has placed limitations on where the large IVQ vessel quotas can be transferred to reduce a spatial redistribution of IVQ ownership across counties (Eythorsson 2016). Another program Norway offers is called the open group fishery that was developed to help small scale fishermen who did not qualify for IVQ quota in 1990. The open group fishery is open to fishermen who own a fishing vessel and have less than $40,000 annual income. These programs were not popular with the large IVQ quota owners at first, but with the increase in cod quota over the past several years, there seems to be less controversy about these new programs (Eythorsson 2016).

Why the Number of locally-held QS and LEPs have decreased in some Alaska Communities

When the Alaska halibut and sablefish IFQ program was implemented in 1995, individuals received quota based on their catch history. Upon receiving the quota, individual fishermen had greater flexibility in their choices of homeport and delivery port and could choose to cash out of the fishery through the sale of their QS. Many QS recipients in rural and urban areas chose to liquidate the asset value of their QS, and many rural QS recipients moved away from remote communities that provided limited or low-quality public services, had a high cost of living, and offered little opportunity for employment outside the fishing season. Those individual decisions to sell QS or move had adverse spillover effects on other businesses and households in the community. (Kotlarov 2018; Carothers et al. 2010)

In pre-historic times, Pacific Northwest native tribes and clans used diplomacy and force to secure spatial rights to the fisheries they relied on (Higgs 1982, Newell 1993, Trosper 2003). With colonization, those prior spatial rights were overridden by new claimants. Early on, and through most of the Territorial Era, fisheries off Alaska were controlled by canneries that operated as local monopsonies that exercised *de facto* territorial use rights through negotiated agreements among neighboring canneries, lobbying federal agents for exclusive spatial rights, or through extralegal means. With statehood, the power of the canneries ebbed, and fisheries came to be mainly allocated pursuant to an open-access race for fish. LEPs, introduced in the 1970s, shifted the race-for-fish from an open-access derby to a limited access Olympic race that encouraged the concentration of fishing and processing capacity near to productive fishing grounds. While fisheries are subdivided into regions based on biological and historical considerations, under federal and state constitutions, the rights of local residents are not superior to the rights of other state residents or other U.S. citizens. That some communities have a lengthy history of serving as a base for fisheries has never imbued those communities with legal authority to decide who gets to fish, how they can fish, or how they may dispose of their catch. Communities are fishing communities because their location and services attract fishermen. Under the race-for-fish allocation system, nearness to productive fishing grounds helped some communities attract more fishermen than other communities. As fisheries were moved to limited entry and quota share allocation systems and as consumer preferences shifted away from canned and other minimally-processed products to product forms requiring access to high-quality transportation services and sophisticated processing technology, the advantages of nearness to productive fishing grounds became less important than the higher exvessel prices offered at larger ports where multiple buyers compete for fish deliveries. Small fishing communities that adapted to new opportunities have continued to thrive under these new circumstances. Those that failed to adapt have seen declines in the number of vessels based in their ports, declines in the number of vessels that deliver to their ports, and declines in the number of fishermen who reside in the community. The direct, indirect, and induced

impacts of declines in fishing, the economic base of fishing communities, have jeopardized their continued existence (Himes-Cornell and Hoelting 2015; Himes-Cornell et al. 2016; Kent and Himes-Cornell 2016). As noted above, the community support measures included in state LEP and federal LLP and QS programs have had limited success in stemming the decline.

Policy changes that make a fishery more profitable tend to favor non-locals. This can occur as a result of policy actions such as the implementation of limited entry or QS programs or as a result of global market dynamics. The price of transferable limited entry permits and transferable QS is quickly bid up to reflect the expected net present value of future catches (Newell et al. 2007; Huppert et al. 1996; Karpoff 1984). Consequently, the cost of entry rises to include the cost of purchasing the required permit or QS in addition to the cost of purchasing a fishing vessel, fishing gear, and supplies. Besides, in limited entry fisheries, the race-for-fish incentivizes investment in large, high capacity, high power, expensive vessels. Non-locals tend to have better access to capital because they have more liquid assets or assets that can be used as collateral, more connections, and are better able to work with banks (Knapp 2016). Paradoxically, policymakers want a fishery to be fished by local residents, and they want it to be profitable. The more profitable the fishery is, the more likely the permits are going to be transferred to non-locals and the non-Alaskans. Policymakers have not been very successful at devising policies that simultaneously promote local fishers and increase fishery revenues (Knapp 2016).

Legal context

Opportunities for community ownership of QS, PQS, LLPs, and LEPs are underpinned and constrained by state and federal law, tribal rights, and international treaties. Although this roadmap is focused on community support programs in federal fisheries, state fisheries management offers some possible avenues for community support. For example, Article VIII, section 15 of the Alaska Constitution, as amended, allows the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State. That is, in addition to limiting entry to support biological sustainability, the State can limit entry to support the economic sustainability of fishing businesses and fishing communities. Moreover, the spatial character of state fisheries management facilitates the adoption of management measures, such as superexclusive registration and pot limits, that tilt the playing field somewhat in favor of local and small-scale fishermen.

The Metlakatla Indian Community has exclusive access rights to fisheries within the Annette Island Reserve. The Reserve surrounds Annette Island with a seaward boundary of approximately one nautical mile. Unlike Metlakatla, the other Native Alaska tribes are parties to the Alaska Native Claims Settlement Act, which assures subsistence fishing rights but does not assure commercial fishing rights. Nevertheless, through their control of

uplands needed for setnet sites, etc., tribes have some ability to exercise influence that contributes to *de facto* local control of local fisheries.

The ten National Standards enumerated in the MSA include two that are particularly relevant to the development of measures to support community-based fisheries. National Standard 8 states that:

> Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

While National Standard 4 stipulates that:

> Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The dissonance between these two National Standards sets the legal context and constraints for federal measures to support fishery-dependent communities. On the one hand, FMPs are to provide for the sustained participation of fishery-dependent communities while, on the other hand, FMPs are proscribed from unfairly discriminating among U.S. citizens. That is, these two MSA National Standards direct that FMPs should favor citizens who reside in fishery-dependent communities but without disadvantaging fishermen who do not reside in those communities. Specifically, under federal law, as confirmed by the courts, residents of one state cannot be preferred to receive quota over residents of other states solely as a function of their residency status (Brennan 2016). Nevertheless, the Regional Fishery Management Councils have developed FMPs that have endeavored to balance National Standard 2 and National Standard 8 and have withstood legal challenges. For example, the NPFMC amended the Alaska Halibut and Sablefish IFQ program to allow the community of Adak the opportunity to establish a non-profit entity authorized to purchase halibut and sablefish quota for community residents to fish (Baker 2016).

The State of Alaska and NOAA fisheries conducted outreach in eligible communities when the CQE program was implemented in 2004. NOAA explained the structure of the program and the process of applying for recognition of CQE entities, and the state explained the application process for state fishing loan programs. Unfortunately, at about this same time, the price of QS quickly climbed, and it became increasingly difficult

for communities to justify QS purchases. Moreover, each new program created to help individuals buy QS has the perverse effect of increasing the demand for a fixed supply of QS, which in turn bids up the price of QS. That is, the introduction of programs to subsidize the purchase of QS or subsidize loans for the purchase of QS invariably increases the market-clearing price of QS, making QS even less affordable for new entrants who do not receive the subsidies.

A Roadmap for Sustaining and Rebuilding Community-based Fisheries in Alaska

This section presents a roadmap suggesting steps that agencies and rural communities can take to sustain or reestablish their fishing fleets through the acquisition of QS, LLPs, PQS, CHPs, etc. The first step is for agencies to conduct outreach to provide each community with a clear explanation of all the programs that are currently available and what their community can do to take advantage of these opportunities. Once this is established, the community should research what quota the community held in the past. This would give them a general idea of their community's history with commercial fisheries. Next, each community needs to develop a strategic plan and identify the specific programs that best address community goals and submit the necessary application materials. Finally, each community needs to identify options for allocating fishing opportunities to community members and recovering costs of acquiring QS, LLPs, etc.

Understanding community fishing history

Provide each community with a clear explanation of all the programs that are currently available to their community and what steps the community needs to take to understand these opportunities better. For example, there are different opportunities for the communities in the Gulf of Alaska and Southeast Alaska under the community quota entity program. Some communities were allocated charter quota that they could lease, and other communities were provided LLP cod quota.

In developing a roadmap for sustaining and rebuilding community-based fishing fleets, it is important to have a clear understanding of past participation and factors that contributed to the decline in participation. The historical baseline of actual landings and permit ownership is available in reports published by the CFEC and the NMFS dating back several decades. Longtime fishermen, processors, and community leaders have local knowledge that can provide an understanding of the factors and circumstances, such as changes in management policies, changes in markets, and changes in stock abundance and returns that were responsible for trends in the historical data. It would be best practice to compile the information and interpretation into a report that would be available for future reference. Public discussion and analysis of the report will help the community determine whether factors and circumstances have changed such that rebuilding community-based fisheries is a viable option. The report need not be exhaustively detailed; a simple summary of key trends could suffice. For example, the community of Angoon in 1995 had a fleet of 29 commercial vessels

participating in the halibut and sablefish IFQ fisheries, and they made 92 offloads from 33 IFQ permit holders (NOAA 2016). The number of QS holders dropped by one half by 2001, and fell to four in 2007; from 2008 until the present, there are no QS holders. This shows a very dramatic drop in QS holders for this community. Another way a community can be analyzed is the actual pounds landed in the community by anyone over a period of time. Again looking at Angoon, in 1995, 275,688 pounds of halibut and sablefish were landed with an estimated value of $773,696. From 2014 until the present, there have been no commercial landings of halibut or sablefish in Angoon. These two indicators represent the beginning of a picture of trends in landings and permit ownership for fisheries in which Angoon-based fishermen have participated. Adding information about the salmon fishery and other fisheries will give the community a comprehensive picture of the fishing history of a community.

Developing a Strategic Plan; to start, develop or enhance a Community Quota Entity program

Once the community has decided it wants to rebuild its fisheries, it should follow a series of steps to support these goals. Crucial steps include where the community wants to go, what they want to archive, and how they are going to get there. Starting with a strategic plan.

1. Strategic plan
    a. In speaking with a leader of the community, have them help identify the people that should be involved in the planning process.
    b. Set up a collective meeting of the community
    c. Present the historical fishing practices of the community
    d. Identify the communities strengths, opportunities, weakness, and threats
    e. Develop a list of broad goals achievable in 4 years
2. Mission statement (needs to be developed)
    a. The role that the community intends to play to facilitate the realization of the vision.
    b. Write what is essential to the community and organization
    c. What is the purpose of the organization
3. Vision statement
    a. Looking into the future of 4 years what has the community done to revitalization their fisheries
    b. What will the headlines be in the national newspaper, the local paper?
    c. What is the community's vision for how the revitalized fishery will be sustained and how it will contribute to the community?
    d. Expand economic opportunity and access to markets for fishermen in the community

4. Goals and steps to achieving those goals, e.g.,
    a. Identify funds that the community can invest in quota and for ways the CQE can generate income
    b. Use charter halibut permits or LLP cod permits or any other funds generated income to save for purchasing IFQ commercial fishing quota to then be leased back to community members.
    c. Strengthen local fishing and fisheries support sector businesses through community acquisition of QS, PQS, CHPs, LLPs, LEPs, etc.
    d. Keep fishing a way of life through training and loan programs to encourage new entrants and through encouraging current participants to continue to use the community as a base for their fishing activities
    e. Lease quota that is purchased back to the community members
        i. Support new generations of fishermen by encouraging both crew and family members to become captains
        ii. Encourage youth to participate in local fisheries.
        iii. Help build businesses that keep money local and uphold local tradition and culture.
5. Objectives
    a. Action statement
    b. Description of how the community organization is going to get there.
    c. Make the milestones easy to measure
    d. Establish targets.
    e. Track progress
6. Financing - Pursing long term funding the CQE should focus on
    a. Develop a track record of working with multiple groups, CQE, village corporations, municipalities, etc., to structure successful community focused financing.
    b. Ability to secure financing with a wide range of collateral types.
    c. Develop financial skills required to structure funding approaches that work with constraints (high prices) of the current IFQ market.
    d. Seek out low down payment requirements, below-market interest rates, and long term loan repayment schedule.
7. Anticipated outcomes and assessment of the extent to which measures taken by the community have succeeded.
    a. A resilient community of fishermen working together
    b. New entrants to mentors working together to revitalize community-based fisheries.

8. Guiding principles
    a. Support growth and stability of well-run fishing businesses
    b. Encourage diversification across fisheries to reduce dependency on a single dominant fishery.
    c. Develop opportunities that maximize the socioeconomic benefits of small boat independent fishing and local processing.

Community leaders need to secure community support for the Strategic Plan; the likelihood of securing community support is increased if community members have contributed to shaping the vision statement, mission statement, goals, and outcomes assessment plan. A well-structured Strategic Plan will guide decisions about what types of QS or permits the CQE will seek to acquire and identify preferred options for allocating fishing opportunities among community members and recovering costs of QS and permit acquisition. Several communities have done this successfully and could serve as models for other communities that are interested in developing an effective CQE.

Finally, the community CQE board needs to identify options for allocating fishing opportunities to community members and recovering the costs of acquiring QS, LLPs, etc. This can be done in many different ways. First, the CQE board reviews applications for eligibility: applicants must be a U.S. citizen who has maintained a domicile in the CQE's community for the 12 consecutive months prior to the declaration of residency on the lease application. Eligible applicants can then be ranked based on the CQE's scoring criteria, such as, whether they already have some IFQ, whether they have prior fishing experience, whether they have previously fished CQE QS, and met associated obligations, and whether they intend to employ community residents as crew. The CQE board may deduct points for fishing violations or failure to pay crew. There are lots of different options, and each community needs to establish its methods.

Impediments to CQE Success

The price of QS has been the biggest obstacle to the development and expansion of CQEs. In 2004 the average price for halibut QS was $6 to $8 a pound. The price for quota is now between $50 and $65 a pound. At current exvessel prices and depressed halibut catch limits, earnings from fishing are insufficient to cover the cost of loan payments, cover variable operating costs, and provide profit to fishermen. For example, in 2019, the purchase of 2,500 pounds of class C halibut QS in Area 2C could cost over $165,000. At current biomass levels, 2,500 pounds of halibut QS would only yield annual landings of 2,450 pounds, which at current exvessel prices would only yield about $14,700 in gross revenue. At a 5% interest rate with a 10-year repayment schedule, annual payments for interest and capital would be $21,368.

Setting up a CQE

If the community supports the establishment (or expansion) of a CQE as part of the Strategic Plan, the next step is to form the CQE or expand the scale and scope of its existing CQE. Once the community has qualified as a community eligible to form a CQE, it can proceed with establishing a 401(c) non-profit corporation to act on its behalf. Next,

1. The non-profit applies to NMFS for authority to receive and hold QS;
2. NMFS provides a 30-day window for the State of Alaska to review the application and make comments.
3. When the application is approved, the nonprofit is certified as a Community Quota Entity (CQE) and is eligible to enter the QS market;
4. The CQE then "leases" annual IFQ permit amounts to community residents;
5. The CQE remains in the market and can buy or sell QS as their finances and interest allow.

There are restrictions on the amount and type of quota that CQEs may purchase. Southeast communities may not acquire halibut quota in Area 3B. Southcentral CQEs may not acquire quota in Area 2C. CQEs may not acquire vessel category D quota—which is reserved for vessels under 35 feet—in Areas 2C or 3A (NOAA 2010). Also, there is a cap on the total quota that can be owned under the program. This was in response to individual quota holders' concerns that, without such a restriction, most of the quota would eventually be owned by communities, leaving little if any available on the market for individuals. The cap for the entire program started at 3% in the first year, 2004, and increases by 3% per year until ultimately up to 21% of all the halibut and sablefish quota under the IFQ program may be held under the CQE program.

As of 2019, only 30 of the 42 eligible communities have established a certified CQE. A list of all the current CQEs is included in Appendix 4.2. The 15 communities that do not currently have a CQE set up are listed in Table 4.4.

Table 4 .4 Communities eligible to participate in the CQE program but that have not, as of 2019, set up a CQE.

Southeast Alaska	**Gulf of Alaska**
Game Creek	Akhiok
Gustavus	Chignik
Hollis	Chignik, Lagoon
Kasaan	Chignik Lake
Meyer Chuck	Ivanof Bay
Naukati Bay	Karluk
	Tatitlek
	Tyonek

This list is updated daily on the NOAA website – this is as of 2019 (NOAA 2019).

Since the implementation of Amendment 66 to the GOA Groundfish Fisheries Management Plan, in 2010, two fishing privileges have been added to the CQE program. These two revisions allow CQE programs to obtain CHPs for the guided sport halibut fishery in Areas 2C and 3A and fixed gear LLPs for Pacific cod in the Western and Central Gulf. These revisions allow CQEs to request a limited number of CHPs to support new charter businesses or as an investment that earns lease payments. The community could also request a fixed gear LLP for Pacific cod in the Western and Central Gulf. In a review of the current charter permits, there are 34 communities that may hold charter permits, but only 19 have applied for CHPs permits. (See Table 4.5.)

Table 4.5. Total number of communities that have applied and not applied for charter halibut permits under the CQE program.

Southeast			Southcentral		
Applied	# CHPs*	Not applied	Applied	# CHPs*	Not applied
Angoon	4	Game Creek	Chenega Bay	7	Akhiok
Coffman Cove	4	Hollis	Halibut Cove	7	Chignik Lake
Edna Bay	4	Kake	Larson Bay	7	Karluk
Hoonah	4	Kasaan	Old Harbor	7	Tatitlek
Hydaburg	4	Klawock	Ouzinkie	7	Nanwalek
Pelican	4	Metlakatla	Port Graham	7	Tyonek
Point Baker	4	Naukati Bay	Port Lions	7	Yakutat
Port Alexander	4		Seldovia	7	
Port Protection	4				
Tenakee	4				
Thorne Bay	4				
Whale Pass					

*The total number of permits held by CQE communities. Each CHP can be used to take out up to 6 anglers per day. As of June 2019 50 CFR 300.67

The fixed gear Pacific cod fishery is a slightly different situation. The NPFMC recommended that NMFS issue some permits to each CQE equivalent to the number estimated to be removed from residents of the represented community, one or two permits, whichever is greater, such that access to Pacific cod remains a long-term

community asset (Sea Grant 2009). Some communities may get up to nine LLP groundfish licenses. Thus Pacific cod LLPs held by CQEs could represent a long-term community asset. The 22 CQEs eligible to hold Pacific cod LLPs are listed in Table 6.

Table 4.6. The total number of Pacific cod LLPs that could be held by CQE communities, 2019

Community	Cod LLPs	Community	Cod LLPs
Akhiok	2	Ouzinkie	9
Chenega Bay	2	Perryville	2
Chignik	3	Port Graham	2
Chignik Lagoon	4	Port Lions	6
Chignik Lake	2	Sand Point	14
Cold Bay	2	Seldovia	8
Halibut Cove	2	Tatitlek	2
Ivanof Bay	2	Tyonek	2
Karluk	2	Yakutat	3
King Cove	9		
Larsen Bay	2		
Nanwalek	2		
Old Harbor	5		

*indicates the number of permits that each community qualified for as of 2019

Of the 22 eligible communities, only five communities (Chignik Lagoon, Old Harbor, Ouzinkie, Sand Point, and Port Lions) have filled out the required documentation within the last six years. At present, only one company is using two Pacific cod LLP held by a CQE, the CQE associated with Sand Point. Earnings from lease payments on CQE-held CHPs and Pacific cod LLPs could provide funds for discretionary investments targeted towards rebuilding local fishing fleets.

Financing

There are options for financing CQE purchases of QS and limited entry permits that could be advantageous to Alaskan communities. The four main options are:

1) Commercial Fishing Revolving Loan Fund: The State of Alaska, through the Division of Investment, offers loans for the CQEs to purchase QS. The interest rate is 2% above the prime rate (not to exceed 10.5%), the maximum loan term is 15 years, and the maximum loan amount is $2 million per community. Also, the State of Alaska requires collateral (vessels, property, or other assets) to cover the loan value (NPFMC 2016). Consequently, while this loan program has been in place for several years, the terms of the loan have not been viewed as favorable, and the program has not been widely used.
2) NMFS Fisheries Finance Program: Under the MSA, cost recovery funds can be used to support loans to assist entry-level and small-vessel fishermen, and refinance QS. NMFS Financial Services Division administers these loans, which are long term, low-interest loans that may finance up to 80 percent of quota value (Kotlarov 2018). For example, the NMFS Financial Services Division (FSD), Seattle

Branch, issues loans to purchase or refinance of QS. These loans are available primarily to entry-level fishermen and those fishing from small vessels. In the Federal fiscal year (FY) 1998, Congressional appropriations established a loan fund of $5 million for each fiscal year. Later Congress increased the IFQ loan authority to $8 million and then to $24 million to meet higher costs of QS in IFQ programs, to serve more constituents, and to provide funds for other catch share programs (NOAA 2012, NPFMC 2016). Over the last several years, the total amounts of loans issued under the NMFS Fisheries Finance Program have decreased substantially. The average loan amount per borrower peaked in 2011 at $365,000, a 250% increase over initial average loan amounts of $104,000. (NPFMC 2016) The decreasing TACs in the IFQ fisheries over the last several years has led the Fisheries Finance Program to implement stricter credit criteria for halibut and sablefish QS loan applicants. The total number of loans went from 52 in 2010 to 7 in 2018 (Bennett 2019).

3) Alaska Commercial Fishing and Agriculture Bank (CFAB): The Alaska Commercial Fishing and Agriculture Bank is a private member-owned cooperative that provides loans for commercial fishing operations using QS as collateral. CFAB makes direct loans to the borrower with a maximum term of 20 years. There are no limits on how much an individual may borrow from CFAB. Fishermen generally need to have collateral for 50% of the equity value of the QS. Other assets can also be used as collateral to offset the down payment if needed.
4) Small Business Administration (SBA) Loans: Communities may be able to access SBA loans to support CQE acquisition of QS and permits. The SBA can provide loans, loan guarantees, and counseling for new businesses that meet program eligibility requirements.
5) Private Social Objective Lenders: Social objective lenders, such as Ecotrust, may offer more generous terms than those offered under State or Federal government loan programs (Fields 2019). For example, to entice fishermen to adopt "best fishing practices," a social objective lender may offer below-market interest rates. Many Alaska region fisheries already comply with "best fishing practices" (Fields 2016).

When the CQE Program was implemented, many thought that the village and regional corporations formed under the Alaska Native Claims Settlement Act (ANCSA) would be a potential funding source for CQE purchases of QS. Alaska Native people own the regional and village for-profit corporations through privately owned shares of corporation stock. However, ANCSA corporations are limited in their investments, in that they face a legal vulnerability in providing "disproportional dividends". In effect, this means corporations must provide dividends (e.g., cash distributions) in equal proportion to shareholders, and cannot benefit a shareholder or group of shareholders disproportionately. The ANCSA corporations find it difficult to provide direct funding, or a loan program, to benefit a specific group of its shareholders, such as a resident fisherman in one of its member villages (NPFMC 2016).

In addition to loan programs, there is a federal new market tax credit (NMTC) program, which was set up to create tax incentives to induce private sector investment in low-income communities. This program might be a source of funding for an expansion of CQE holdings of halibut and sablefish QS or LLPs. For example, the CDQ group Coastal Villages Region Fund (CVRF) used the NMTC to attract financing used to build a new fish processing plant in Goodnews Bay. Construction of the plant created 325 construction jobs. While operating, the plant employed 225 permanent seasonal employees and purchased fish from 596 fishermen (NMTC 2019). Unfortunately, the plant was not financially self-sufficient and relied on substantial subsidies ($6 to $7 million per year) from CVRF (Demer 2017). CVRF discontinued the subsidies in 2018, and the plant has ceased operation.

Land and Fisheries Trusts

Land trusts and water trusts have a long history as tools for unbundling various use rights from the suite of rights attached to real property. Land trusts have also been used as an organizational framework for the administration and disposal of public lands set aside to generate income to support public services, such as land grant colleges, K-12 education, and mental health services. For example, a land trust could be set up to maintain farmland on the urban-rural fringe. When there is a high demand for residential development, there may be a substantial difference between the price of land for development and the value of the marginal product of land in agriculture along the urban-rural fringe, and farmland will tend to be developed (Wright and Anella 2007). Groups interested in preserving agrarian land could form a trust to purchase the land outright or to purchase the associated development rights (conservation easements) from willing landowners (Daniels 2000, Parker 2004). The most common limitation attached to such easements is a legal restriction of future subdivision and development of the land (Kiesecker et al. 2007). Payment for the development rights could be some combination of present and future direct payments and tax breaks in exchange for amendment of the property title by covenant (specification of prohibited land uses) or by easement (specification of permitted uses).

The Alaska Mental Health Land Trust is a good example of the second category of Land Trust—public lands that are given as an endowment to be used to generate revenues needed to support a specific public purpose. In this instance, Congress endowed the trust with one million acres of land to generate revenues to support a comprehensive mental health care program. The trust works like a private foundation with a Board of Trustees charged with managing the portfolio of lands and funding projects and programs that improve the lives of beneficiaries. On average, the trust grants $10 million per year to various state agencies that provide mental health services and to individuals who qualify for mini-grants. The Alaska Mental Health Trust Authority receives income from land sales, royalties from coal, oil/gas material, and mineral, right of way easements, and timber sales. The trust uses this income to invest in the trust assets. The mineral interest in the Fort Knox mine

is an example of how the trust receives royalties on the mine production each year. Since the mine production has started, the royalty payments to the trust have been over $24 million (Alaska Mental Health Trust Authority 2018).

Fisheries Trusts

Fisheries Trusts are similar to the first form of Land Trusts; they are established to support the continuation of place-based activities that are at risk due to market forces. Fisheries Trusts are private non-profit organizations established to support retention of LEPs, LLP, QS, IFQ, etc. Fisheries Trusts may act as permit banks, leasing or selling QS and permits to local fishermen. Like Land Trust lands, QS and permits leased or purchased from Fisheries Trusts may be subject to covenants or easements restricting resale or subletting of the QS or permit and specifying particular fishing practices (e.g., fish handing techniques and bycatch reduction measures). One key difference between Fisheries Trusts in Land Trusts is that in many nations, including the United States, LEPs, LLPs, QS, and IFQ are conditional use rights and lack many of the legal protections that are attached to the ownership of land (Mansfield 1994, Schwindt and Globerman 1996). For example, it is easier for governments to revoke or amend conditional use rights than it is for governments to take private land or to introduce new restrictions on the use of private land. While these differences between conditional use rights and real property are meaningful, the differences are not absolute; they are a matter of degree (Hanisee 1993). For example, federal, state, or local governments can seize private land through eminent domain or change the suite of permissible uses of private land through, zoning or designation of critical habitat, etc. Similarly, although many conditional use rights are ostensibly revocable without compensation, governments often choose to compensate permittees when those rights are terminated or attenuated (Criddle and Wardle 2018). For example, federal and state funds are often used to reduce overcapacity in fisheries through the purchase and retirement of LEPs when the same reductions could be achieved through revocation of permits that have not even been used in recent years (GAO 2000, Hannesson 2007, Squires 2010).

Several non-profit fisheries trusts have been set up on the east coast of the United States, on the Gulf of Mexico coast, in California, and Alaska to support retention of fishing rights. Most of these fisheries trusts are structured as permit banks that acquire LEPs, LLPs, or QS to lease to local fishermen at favorable rates. While their accomplishments and challenges have depended on their goals, structure, and level of flexibility, the main barrier fisheries trusts have faced has been access to capital.

Cape Cod Fisheries Trust (CCFT)

The Cape Cod Fisheries Trust (CCFT) was formed in 2008. CCFT first bought quota in 2008, and now owns more than six million pounds of scallop and groundfish quota. The original funding to capitalize the trust

included gifts from provided by fishermen and other private donors, grants from charitable foundations, loans from banks to private individuals who subsequently donated the loan amount to the trust (these bank loans were often offered at below-market rates), and loans from charitable foundations to the CCFT that were offered at 1-3% interest rates (Parker 2019). The initial loans have been paid off, and a new round of loans have been granted to allow the trust to assist fishermen in more quota. The trust's objective is to stem the outmigration of locally owned quota and to encourage local fishermen to diversify the suite of species they target to help them avoid becoming overly specialized and reliant on a single fishery (CCFT 2019). CCFT pursues its objective by operating as a quota bank; it buys quota from retiring fishermen and leases it to local fishermen at submarket rates. CCFT also provides financing, business planning, and technical assistance to fishermen who want to buy quota and build their businesses. CCFT's quota portfolio has appreciated and CCFT has been able to stabilize the cost of access to quota for local fishermen (CCFT 2012). In 2019, the CCFT leasing program helped 106 captains and crew working aboard 26 fishing vessels to catch 623,000 pounds of fresh seafood worth $2.9M in fisheries off Cape Cod (CCFT 2019). These "fishing dollars" stay on Cape Cod and have a multiplier effect on the Cape's economy. Since CCFT was formed, none of the quota held by the local fleet has been sold to larger off-Cape companies. Indeed, local ownership of scallop quota has increased by 26% from 2009 to 2011. The trust is also helping scallop and groundfish fishermen diversify their catches to include dogfish, monkfish, skate, tuna, lobster, conch, and striped bass (CCFT 2019). The CCFT has become an inspiration and model for others who are working to create sustainable fisheries and economies, and the Fund has continued to receive support from investors.

Recently the founders of the Cape Cod Fisheries trust established a charitable fishing organization called Catch Together that provides low-interest loans to fisheries trusts in other regions (Table 4.7).

Table 4.7. Loans made to fisheries trusts in different regions

No.	Transaction	Community Partner	Species	Approximate $	Co-Lenders
1	Martha's Vineyard Scallop	Martha's Vineyard Fishermen's Preservation Trust	Atlantic scallop	$1.0M	Woodcock Foundation, Stephenson Foundation, Fink Family Foundation
2	Martha's Vineyard Whelk Permits	Martha's Vineyard Fishermen's Preservation Trust	Channel Whelk		The Nature Conservancy
3	Martha's Vineyard Lobster Tags	Martha's Vineyard Fishermen's Preservation Trust	Atlantic lobster		
5	New England Groundfish	Cape Cod Commercial Fisherman's Alliance	New England groundfish, Atlantic scallop	$1.0M	
6	Gulf Shareholders	Gulf Shareholders Alliance	Red snapper	$2.0M	Campbell Foundation
7	Local Fish Fund	Alaska Sustainable Fisheries Trust	Sablefish, halibut	$2.0M	Rasmuson Foundation, The Nature Conservancy
8	Sablefish A-Shares	Alaska Sustainable Fisheries Trust	Sablefish	$1.0M	

(Parker 2019)

Martha's Vineyard Fishermen Preservation Trust

The Martha's Vineyard Fishermen Preservation Trust was started because the price for quota was not affordable for local small boat fishermen. The trust worked closely with the former director of the Cape Coder Fisheries Trust and founder of Catch Together to acquire quota. The Martha's Vineyard Fishermen Preservation Trust initially raised $500,000 on its own and received two $250,000 loans from investors (Reichel 2017). The fishing community was being pressured to move out of their local towns to make room for more yachts. The community worked together to support local fishing and understand the importance of the year-round economic impact of having a local fishing fleet. There are currently eight communities that participate in the Martha's Vineyard Fishermen Preservation Trust (CCFT 2019).

Reef Fish Quota Bank

The Reef Fish Quota Bank was started in 2013 and operates in the Gulf of Mexico from, Texas to Florida. The quota bank was initially funded by donations and philanthropic contributions from fishermen. They started working with CCFT's Catch Together in 2016. The primary purpose of the Reef Fish Quota Bank is to help grouper fishermen obtain red snapper quota. Under the regulation, grouper fishermen have to discard

red snapper unless they have sufficient quota. By helping fishermen obtain red snapper quota, the Reef Fish Quota Bank reduces bycatch discards and associated discard mortality and increases fishing revenues. Eligible fishermen can lease red snapper allocations from the Quota Bank on an annual basis. They lease the quota in advance of their trips and report their usage rates after each trip. As of 2019, the Reef Fish Quota Bank has acquired more than 70,000 pounds of red snapper for allocation to grouper fishermen (Gulf of Mexico Reef Fish Shareholders Alliance 2019, Brazer 2019).

Alaska Sustainable Fisheries Trust

The Alaska Sustainable Fisheries Trust (ASFT) was formed to promote and support access for communities and independent fishermen. The ASFT mission is to strengthen Alaska fishing communities and marine resources through research, education, and economic opportunity. ASFT views maintaining or increasing the number of fishing permits and the amount of QS held by community residents as essential mechanisms for incentivizing sustainable, conservation-oriented fishing practices such as sharing information to avoid bycatch (Behnken 2016). To support that mission, the ASFT seeks to help fishermen overcome barriers to entry. In a survey conducted among halibut and sablefish fishermen, the main reasons listed for not purchasing QS in Alaska were the difficulty obtaining financing, concerns about low TACs, and concerns the growth of charter catches (Kotlarov 2016). ASFT recognizes that residents of rural Alaska communities have few alternative income sources to help support the purchase of QS and that the IFQ program has dramatically increased the cost of entry (Behnken 2016). Rural residents have limited access to capital and often few employment alternatives to fishing. The transition of fisheries from open access to limited access and QS systems has added to the cost of entry. The cost of LEPs, LLPs, or QS is often as much as or much more than the cost of purchasing a fishing vessel and fishing gear. Often, fishermen who are retiring care about the next generation of fishermen and the sustainability of their fishing-dependent communities, but they also are cognizant of their financial investment and the need to plan for retirement (Behnken 2019).

The local fish fund was established to support Alaska's fishing communities by reducing specific barriers to entry into commercial fisheries. The Alaska Sustainable Fisheries Trust established this fund with the main goal of engaging the next-generation fishermen in policy leadership. Alaska Sustainable Fisheries Trust was set up to capitalize the Local Fish Fund from supporters like the Nature Conservancy, Craft3, Rasmuson Foundation, and Catch Together (Parker 2019).

The loan that is given to the fishermen is different than the traditional commercial loan with fixed payments like a car or house loan. The Local Fish Fund uses a "revenue participation" system in which loan repayment is based on fish landings rather than a fixed loan repayment structure. The loan also incentivizes LFF borrowers

to participate in resource conservation and management initiatives through variable interest rates (Behnken 2019. The fund offers loans with reduced down payment options with competitive interest rates. The overall goal is to allow fishermen to build sufficient equity to access conventional loans. This program is one of the few paths of ownership of quota for new fishermen in Alaska to bring ownership back to rural communities in Southeast and the Gulf of Alaska.

The Local Fish Fund was set up by the Alaska Sustainable Fisheries Trust located in Sitka, Alaska. The loan fund aims to support Alaska's fishing communities by reducing some barriers to entry into commercial fisheries and to encourage next-generation fishermen to enter into commercial fisheries. Another goal of the ASFT is marine stewardship and policy leadership. Alaska Sustainable Fisheries Trust was supported in setting up and capitalizing the Local Fish Fund by The Nature Conservancy, Craft3, Rasmuson Foundation, and Catch Together (Behnken 2019). These loans are not like the traditional commercial fish loans that require fixed payments, like a home loan. The Local Fish Fund loans use a "revenue participation" approach in which loan repayment is based on fish landings rather than a fixed loan repayment structure. This method lowers the risk for entry-level commercial fishing businesses because the allowable catch and fish price can vary dramatically from year to year.

The Local Fish Fund offers loans with competitive interest rates and reduced down payment options, and allows fishermen to build sufficient equity to access conventional loans. These agreements provide new fishermen with a path to ownership, which is anticipated to ultimately bring ownership back to rural communities in Southeast Alaska and the Gulf of Alaska and sustain them over time. (Behnken 2019.

ASFT secured $1.5 million in 2019 for Program Related Investment capital to lend to entry-level fishermen willing to purchase and fish halibut or sablefish quota share. ASFT also purchased category A share halibut quota that can be leased to fishermen to generate cash flow for fishermen and fund conservation initiatives (Behnken 2019). The ALFA has also started an apprenticeship program, and as of 2019, 54 apprentices have entered the program. ASFT is currently accepting LFF applications from Alaska residents.

Morro Bay Community Quota Fund

In contrast to the preceding examples, the Morro Bay Community Quota Fund (MBCQF) was kick-started by The Nature Conservancy (TNC), an environmental NGO with a long history of involvement in Land Trusts. Before 2000, most of the fishing based out of Morro Bay, California, was done by trawlers. Their catch consisted primarily of a mix of rockfish species, including several with very small TACs. Catches of those species had to be discarded when their TAC was exceeded. Because rockfish have a closed swim bladder,

discarded rockfish suffer high mortality. In addition, there were concerns about habitat impacts of the trawl gear, and trawl-caught rockfish had lower market value than line-caught rockfish. In 2000, the fishery was declared to be "overfished" and placed under a stock rebuilding plan. Also, the fishery was declared an economic disaster (Brown 2014, Bell 2014). TNC got involved in reducing fishing effort, improving fishing methods, and preserving habitat. They reached an agreement to buy limited entry licenses from fishermen wanting to exit the fishery (Deacon 2009). TNC also drew on the fishermen's expertise to design a new habitat closure area and engaged with the Pacific Fisheries Management Council as the Council modified the FMP for this fishery from an LLP to QS. As the fishery transitioned to a catch share system, and the partnership between TNC and local fishermen developed into the MBCQF, and TNC transferred its QS to the MBCQF to permanently secure local access to fishing. The MBCQF leases QS to local fishermen (Morro Bay 2014). Between 2014 and 2017, the fisheries trust leased between 580 to 219 thousand pounds to local fishermen. Between two and three local vessels participated in the fisheries during this period.

Table 4.8. Local Lease participation MBCQF

Local Leases and Participation	2014	2015	2016	2017
Total Non-Whiting QP leased locally	1,793,719			
Total MBCQF QP leased Annually	476,189	517,164	580,911	219,455
Total number of local Vessels	3	2	2	2
MBCQF QP Landed Locally	561,816	446,711	274,813	227,862
Total Morro Bay Landings	6,669,442	3,455,138	4,168,680	4,052,431
Total landings as a % of total Morro Bay Landings	8%	12.9%	6.6%	5.6%

Ecotrust

Ecotrust was formed in 1991, and in 2006, Ecotrust formed the North Pacific Fisheries Trust to support the efforts of coastal communities and local fishing families. Ecotrust wanted to provide financing and make investments in community organizations, quota entities, and meet economic development goals. To date, Ecotrust has helped finance one loan to the CQE representing Old Harbor (NPFMC 2016). Ecotrust has not completed any additional loans and is currently not taking applications for more communities in Alaska at this time (Lane 2019, Kadish 2019).

Conclusion

This chapter has given a brief overview of changes in commercial fisheries in Alaska and how those changes have affected small coastal communities. Until now, most discussions of the negative impacts of IFQ on small communities have failed to offer viable suggestions for helping rural communities reestablish and sustain their fishing-based economies (e.g., Carothers 2008, Carothers et al. 2010). This chapter has focused on the halibut

and sablefish IFQ program, and it provides an overview of different management programs from three other fisheries and varied levels of success.

All of the fisheries in Alaska changed dramatically in 1976 when the U.S. fishing boundaries expanded from 12 to 200 miles offshore. By the early 1990s, these new fisheries had large fleets that could quickly harvest the total annual catch in a short time, and this increased the competition among the vessels (Strong and Criddle 2013). The resulting race-for-fish reduced the value of the landed catch, increased the risk of overharvest, increased risk-taking by fishermen, and reduced the economic viability of fishing. These events led the fisheries managers on the North Pacific Fishery Management Council to adopt catch share policies to restrict access to several fisheries.

Before the North Pacific Fishery Management Council started rationalizing the federal fisheries, the State of Alaska had already taken steps to manage their fisheries through limited entry.

In 1992, federal fisheries managers started analyzing the large federal fisheries in Alaska and began taking steps to rationalize those fisheries. –All of these federal fisheries had been over-capitalized and needed to be regulated more effectively. While restricting the access helped to make the fisheries more manageable and addressed some economic and social concerns, it created new economic and social dynamics between fishermen, crew, processors, and, of course, their Alaskan communities. The impacts on the small communities following the transitions from open- to limited-access or share-based management brought about negative impacts on some communities while it brought benefits to other communities.

The primary concern is the reductions in the quota share held by residents of some small for halibut and sablefish in the Central GOA that depend on commercial fishing for their economic base (e.g., Carothers 2008, Carothers et al. 2010). The transfer of QS to persons outside a local area and changes in delivery patterns under the program might have harmful effects on some communities.

Once these catch-share programs were established, smaller communities had concerns that the programs did not benefit them, and so these fisheries set up programs specifically designed to help these small rural communities. The affected communities are all unique and require different approaches to resolve their fisheries-related issues. The State of Alaska manages the salmon fishery and has tried to set up special loan programs to help new entrants purchase LEPs.

The Bering Sea pollock TAC quota allocated 7.5% percent to the established Community Development Quota (CDQ) program representing 64 small communities in Western Alaska. Over time, the pollock CDQ increased to 10%, and the program was augmented to include allocations of portions of the TAC for halibut, sablefish, crab, and other groundfish species

The halibut and sablefish IFQ program was amended to provide for the Community Quota program in 2004. The program allowed communities to form nonprofit Community Quota Entities (CQEs) that could purchase halibut or sablefish QS to be leased to community members. This program has not been as successful

as the policymakers had hoped. By 2019, only five CQEs have purchased quota, and the total amount of QS held by the CQEs is small.

The BSAI Crab fishery has several programs that have been set up to benefit smaller communities. First one is a provision to purchase processing quota from a processing company when the processors want to sell their shares outside the community. A second program that helps rural communities in Western Alaska is the CDQ crab allocation, which allocates 10 percent of the entire BSAI TAC to the six non-profit organizations that represent the CDQ communities. A third program called the EECO program is similar to the halibut CQE. It allows the community to purchase and own crab quota to be leased to community members. The last program is a unique program in Norton Sound allows a vessel to fish in their area only if they do not fish in any other location. This is called a super-exclusive system and has allowed the community to participate in the fishery more exclusively.

Since some programs that have been established for these communities are not fully being utilized and are often not well understood due to the complexity of the regulations, a final section in this research establishes a "roadmap" for sustaining and rebuilding community-based fisheries in Alaska. This roadmap sets out steps that a community needs to do once it has received a clear explanation of all the programs currently available and the advantages of these opportunities.

Another positive step that has been helping communities is the increased number of fisheries trusts that have emerged in the United States and in Alaska that are committed to helping small communities gain quota for this economic well-being. This chapter describes a few fisheries trusts and how they were able to accumulate quota and distribute the quota to younger generation fishermen living in small communities.

The outcome of this research is hopeful that there is some progress in the communities' finding opportunities to generate more fishing income for their community. When writing marine policies, the policymakers should focus on maintaining the sustainability of the fisheries as well as meeting the needs of fishermen and coastal communities. This means making sure fishermen are safe, and fisheries operate efficiently and profitably, along with minimizing their impact on the environment and, most importantly, including the small communities in the discussions so that they do not become left out. There is a real opportunity for communities in Alaska, and if they can navigate through all the regulations, it would be worth it for their next generation and their ways of life.

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Appendix 4.1

CQE Non-Profit	Community Name
Adak Community Development Corporation	Adak
Admiralty Island CQE	Angoon
Chenega Heritage Incorporated	Chenega Bay
Coffman Cove CQE	Coffman Cove
Aleutia, Inc.	Cold Bay
Edna Bay Community Fisheries	Edna Bay
Elfin Cove CQE	Elfin Cove
Halibut Cove Fisheries and Mariculture Holding Company	Halibut Cove
Hoonah Community Fisheries Corporation	Hoonah
Hydaburg Community Holding Corporation	Hydaburg
Kupreanof Island CQE	Kake
Organized Village of Kasaan CQE	Kasaan
Aleutia, Inc.	King Cove
Klawock CQE	Klawock
Larsen Bay Development Company	Larsen Bay
Nanwalek Natural Resources Fisheries Board, Inc.	Nanwalek
Cape Barnabas, Inc.	Old Harbor
Ouzinkie Community Holding Corp (OCHC)	Ouzinkie
Pelican Fishing Corporation	Pelican
Perryville CQE, Inc.	Perryville
Point Baker Community Fisheries, Corporation	Point Baker
Port Alexander Community Holding Corporation	Port Alexander
Port Graham CQE, Inc.	Port Graham
Port Lions Fisheries, Inc.	Port Lions
Port Protection Community Fisheries Corporation	Port Protection
Aleutia, Inc.	Sand Point
City of Seldovia Community Holding Corporation	Seldovia
Tenakee Springs Business Association	Tenakee Springs
Thorne Bay Fisheries Association	Thorne Bay
Whale Pass Charter Halibut Permits Management Committee	Whale Pass

Chapter 5. Overall Conclusion

This dissertation was developed to contribute to a nuanced understanding of the development, evolution, and consequences of the Alaska Halibut and Sablefish IFQ program and to explore community protection measures that have been added to the program. The three central chapters were written to help readers better understand the fisheries and the complexity of the rules and to suggest program improvements. As discussed in Chapter 2, the Alaska Halibut and Sablefish IFQ program was designed to promote biological and economic sustainability. These fisheries were biologically and economically distressed in the late 1980s and early 1990s, and a change in management structure was imperative to prevent overfishing and increase fishermen's safety. The season had decreased from months in the 1970s to mere days (for halibut) or weeks (for sablefish). Halibut and sablefish fishermen were racing for increasingly smaller shares of the TAC; the ex-vessel value of halibut was low because the catch was landed in increasingly short seasons that precluded the development of high-value fresh product markets, and both fisheries were becoming increasingly difficult for fisheries managers to control. Both fisheries were experiencing high bycatch, lost gear, grounds congestion, compressed seasons, and high discard mortalities.

While developing the Alaska Halibut and Sablefish IFQ program, the NPFMC brought in specialists from New Zealand and Canada (regions where individual quota programs had been implemented). The consultant from New Zealand made it clear that many good things can come out of implementing an IFQ program, but that IFQ programs may disadvantage small boats (Behnken 2018). To address some of the social issues that developed in these other programs, the NPFMC added features that were intended to preserve the small-boat, independent operator character of the fishing fleet and to prevent excessive consolidation. The program elements intended to contribute to these goals included owner-onboard requirements, caps on the amount of quota that could be held by a person or fished from a vessel, transfer restrictions, and a fixed distribution of quota to particular vessel size classes. The intent was to preclude large corporations from dominating the fishery as had occurred in the United States surf clam/ocean quahog IFQ fishery (NRC 1999) and in other IFQ fisheries, including in New Zealand and Canada (Boyd and Dewees 1992).

One of the unforeseen consequences and criticisms of the initial issuees' privileges in the Alaska Halibut and Sablefish program was the use of hired masters. It was intended that the option of using hired masters would alleviate infrequent hardships associated with the old age, ill health, or misfortune of initial recipients without adversely affecting the owner-operator character of the fishery. However, this provision came to be widely abused, fostering the development of absentee ownership similar to what had occurred in Canada's IVQ halibut fishery (Casey et al. 1995). In 2014, the NPFMC amended the Alaska Halibut and Sablefish IFQ program to prohibit initial recipients from acquiring additional catcher vessel quota share (QS) to be fished by a hired master on their behalf.

The Alaska Halibut and Sablefish IFQ program has been cited as a contributing factor to the decline of remote fishery-dependent communities (Carothers 2008). The nearly simultaneous collapse of exvessel prices for Alaska salmon has also been cited as a factor driving the decline of remote fishery-dependent communities (Criddle 2012). Beginning in the 1990s, processing capacity began to migrate from small ports proximate to the fishing grounds to larger rural and urban communities with well-developed freight connections. Limited Entry Permit (LEP) holders and QS holders also migrated to larger, urban cities with better retail, educational, community, and social services. The elements that promote the social and economic resilience of fishery-dependent communities are challenging to achieve through program design and implementation. For example, although the NPFMC amended the Alaska Halibut and Sablefish IFQ program QS ownership restrictions to allow specific Gulf of Alaska (GOA) communities to form Community Quota Entities (CQEs) empowered to purchase QS for lease to community residents, the CQE program has not proven as successful as expected. As of 2019, fifteen years into the program, only five of the 46 CQE-eligible communities had purchased QS.

Some of the NPFMC's other concerns about the halibut and sablefish fisheries were addressed through increased management precision and lengthening the overall fishing season. Increased management precision eliminated overharvest. Longer seasons contributed to safety-at-sea and improved fish quality. In the sablefish fishery, IFQ management led to increased catch rates and decreased harvests of immature fish.

The Alaska Halibut and Sablefish IFQ program is a unique program with harvesting privileges tightly regulated by the government to maintain the original character of the fishery. However, program features that limit the free working of the marketplace result in losses of economic efficiency from the perspective of QS holders and lead to increased government administration and infrastructure costs. As policymakers consider design features to achieve social goals, they should be aware that such features generally require expanded government oversight. In addition, when political influence is involved in developing new amendments, the outcomes are unlikely to maximize the economic benefits to society. Commercial fisheries management occurs in political arenas where power dynamics can and do affect policy choices.

Chapter 3 described the results of a survey that was conducted to gather information on crewmembers and fuel costs in the Alaska halibut and sablefish fishery. Results showed that for small vessels in areas such as Southeast Alaska, the crew tended to be local residents. In contrast, the crew on the larger vessels that fished in more remote areas, such as the Aleutian Islands, tended to be hired from outside the local region. Results also showed that vessels based in more remote areas, such as the Aleutian Islands, tended to have greater difficulty finding crew and higher operating costs compared to vessels based in areas of Alaska that had larger population bases. Financing to purchase more QS for halibut and sablefish was harder to obtain for those in remote areas. Nevertheless, respondents who fished in those areas expressed the highest level of intent to purchase more QS.

Chapter 4 focused on the evolution of the Alaska Halibut and Sablefish IFQ program and provided an overview of community-support measures reflected in management programs from other Alaska region fisheries. The impacts on the small communities following the transitions from open- to limited-access or share-based management were negative for some communities and positive for other communities. One significant concern of the NPFMC was the reduction in halibut and sablefish QS held by residents of remote communities in the Central and Southeast Alaska. The transfer of QS to persons outside a local area and changes in delivery patterns under the program can harm communities. The resilience of fishery-dependent communities depends on the state of the available fish resources as well as the extent to which community

residents are vested in the fishery through ownership of LEPs, QS, etc. Concerns about the long-term social changes that have occurred since the implementation of the Alaska Halibut and Sablefish IFQ Program have been voiced by some fishery stakeholders (Pautzke 1997). Specifically, constituents are concerned about perceived financial barriers to entry (and exit); the growth of *de facto* (and *de jure*) leasing and consequent dilution of owner-on-board requirements; reductions in the number of crew positions; and changes in crew compensation, due to share payments to quota shareholders.

Under limited entry in the salmon fisheries, there has been a drop in LEP ownership in Alaska rural communities, from ownership of 54% of the total salmon LEPs in the 1970s to ownership of only 44% the total LEPs in 2004. In response to this, the State of Alaska set up special loan programs to help new entrants purchase LEPs. The State of Alaska has also introduced new regulations intended to reduce barriers to enter the salmon fisheries. For example, regulations now allow permit holders to join together to fish a longer net from a single boat in the Bristol Bay drift gillnet fishery. It was envisioned that this option would create a lower-cost path for younger fishermen to enter the fishery. Unfortunately, this program appears to be more frequently used by nonresidents than by local fishermen (CFEC 2018).

Under the Western Alaska Community Development Quota (CDQ) program, six nonprofit organizations representing 65 rural communities have been awarded harvest rights to 10% of the pollock Total Allowable Catch (TAC) as well as harvest rights to portions of the TAC for halibut, sablefish, crab, and other groundfish species. This program has been very lucrative for eligible remote rural western Alaska communities

In 2004, the Alaska Halibut and Sablefish IFQ program was amended to allow 42 communities to form nonprofit Community Quota Entities (CQEs) that could purchase halibut or sablefish QS to be leased to community members. This program has not been as successful as the policymakers had hoped. By 2019, only five CQEs had purchased quota, and the total amount of QS held by the CQEs is small. The CQE quota could be leased out each season to generate income to purchase additional QS, which could be used to help the younger generation in rural communities start their careers in commercial fishing. In 2008, the NPFMC

offered the CQE communities' charter permits (CHLAP) and/or Pacific cod permits (LLPs) at no cost, with the hope that the CQE could leverage their assets more effectively. This has been successfully done by the CQE in Hoonah, Alaska, over the past few seasons. Hoonah has leased out its charter permits to generate income that was used to purchase commercial IFQ halibut quota. This model could be used for other CQE communities that qualify. Surprisingly, several communities do not even use their free CHLAPs, and 99% of qualifying communities do not use their LLP cod permits.

Under the BSAI Crab fishery, several amendments were passed to benefit smaller communities that have not been fully utilized. One is a provision in the regulations that allows communities the right of first refusal to purchase processing quota from a company processing crab when the processors want to sell their shares outside the community. To date, only two communities have taken advantage of this provision, which generates income for the communities each year. A community support measure for the BSAI Crab fishery could expand this program to other qualified communities. These communities would need to produce a long-term management plan for their communities and set goals to own a set amount of processing quota.

Another opportunity for community support is the Eligible Crab Community Organization (ECCO) program, which is similar to the Halibut Sablefish CQE program. The ECCO program allows a community to purchase and own crab quota to be leased to community residents. The king crab fishery is very profitable, and entering this program could be an economic boost to a community. It would take coordination from the city, the community members, and the fishermen to set this up, but the result could be very beneficial for the community.

Many of the programs that have been established to benefit fishery-dependent communities are not being utilized, which may be due, in part, to the complexity of the regulations and the limited resources that small communities have to track actions by the NPFMC or the Alaska BOF. More outreach by the State of Alaska and NOAA fisheries to explain community support measures included in fisheries regulations would likely be effective. It is emphasized in this dissertation that for communities to succeed in building their local rural fleets, they need to increase cooperation and coordination to establish quota. This research establishes a

"roadmap" for sustaining and rebuilding community-based fisheries in Alaska. It requires the community to focus on its cooperative goals to enable them to take advantage of the community support measures included in fisheries regulation. The most challenging part for the community is to identify funds to purchase the QS or LLP. Once the community has acquired QS, it can establish a method for allocating fishing opportunities to community members and recovering the costs of QS or LLP licenses acquisition. Fisheries Trusts are another mechanism that communities could use to obtain quota and sustain or rebuild their fisheries sector. In Alaska, Fisheries Trusts could collaborate with the CQEs, ECCOs, or CDQs to provide favorable terms on loans for purchasing quota, developing processing capacity, and direct marketing. These would be additional examples of better utilization of existing community support measures.

That youth in Alaska are interested in commercial fisheries is evidenced by the popularity of the apprenticeship program developed by the Alaska Longline Association in Sitka. Strong interest in the Alaskan Young Fishermen Summit hosted by Sea Grant each year further indicates that young Alaskans are looking for opportunities to become fishermen. Rural communities could contribute to the development of a next generation of fishermen by nurturing their youth's interest in fisheries and reestablishing their cultural heritage by using the Federal halibut special permits for Ceremonial, Celebration, and education fisheries. These permits are free and require a minimal amount of paperwork through the NOAA fisheries Restricted Access Management program. The State of Alaska also has an educational permit program that is underutilized but has been successfully used in the past by, for example, Cordova High School. These programs need to be reestablished in local schools.

The Alaska Halibut and Sablefish IFQ program is one of the largest and most successful of the United States catch share programs. It has been successful in maintaining these fisheries for the past 25 years. While most of the federal fisheries off Alaska have already transitioned to catch-share management systems, the development of new catch share programs for other regions could benefit from lessons learned in the development and evolution of the Alaska Halibut and Sablefish IFQ program. Perhaps one of the essential take-home lessons is that program design and redesign are ongoing processes; catch share programs need to

evolve to reflect changes in the managed stock and evolving social objectives. The Alaska Halibut and Sablefish IFQ program is adapting over time to better accomplish initial goals and resolve new issues that may arise.

One positive outcome of this research would be for rural communities to engage in more opportunities to generate fishing income for their community. When regulators are writing amendments, they should focus on maintaining the sustainability of the fisheries as well as meeting the needs of fishermen and coastal communities. Communities could have a real opportunity to bring fisheries back into their rural areas in Alaska, and if they are able to navigate through all the regulations, it could change their next generation and their ways of life.

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Appendix 5.1

Aleutian Pribilof Island Community Development Association (APICDA)

APICDA represents the villages of Akutan, Atka, False Pass, Nelson Lagoon, Nikolski, and Saint George.

Bristol Bay Economic Development Corporation (BBEDC)

BBEDC represents the villages of Aleknagik, Clark's Point, Dillingham, Egegik, Ekuk, Ekwok, King Salmon, Levelock, Manokotak, Naknek, Pilot Point, Port Heiden, South Naknek, Togiak, Twin Hills, and Ugashik.

Central Bering Sea Fishermen's Association (CBSFA)

CBSFA represents the village of Saint Paul Island.

Coastal Villages Region Fund (CVRF)

CVRF represents the villages of Chefornak, Chevak, Eek, Goodnews Bay, Hooper Bay, Kipnuk, Kongiganak, Kwigillingok, Mekoryuk, Napakiak, Napaskiak, Newtok, Nightmute, Oscarville, Platinum, Quinhagak, Scammon Bay, Tooksook Bay, Tuntutuliak, Tununak.

Norton Sound Economic Development Corporation (NSEDC)

NSEDC represents the villages of Brevig Mission, Diomede, Elim, Golovin, Gambell, Koyuk, Nome, Saint Michael, Savoonga, Shaktoolik, Stebbins, Teller, Unalakleet, Wales, and White Mountain.

Yukon Delta Fisheries Development Association (YDFDA)

YDFDA represents the villages of Alakanuk, Emmonak, Grayling, Kotlik, Mountain Village, and Nunam Iqua.